ELECTRICAL REVIEW

5th JUNE, 1953

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IN THIS ISSUE

Power Convention	1255
Portrait of Sir John Hacking	1257
Devon Sub-Area	1259
B.E.P.C. Programme	1270
Convention Exhibition	1271
Generation in Great Britain	1285
Views on the News	1299
Personal and Social	1300
Electro-Plastics	1307
Temperature and Humidity Control	1313
Commerce and Industry	1316
Electricity Supply	1319
Manufacture in South Africa	1321
Financial Section	1325
New Patents	1329
German Electrical Imports	1330
Contract Information	1331
Classified Advertisements	189
Index to Advertisers	204

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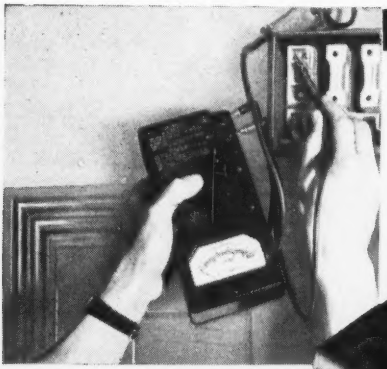

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ELECTRICAL REVIEW

5th JUNE, 1953

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872 • VOL. CLII • NO. 23

Power Convention

ON Monday next the fifth British Electrical Power Convention opens at Torquay and representatives of all branches of the electrical profession and industry and their ladies, numbering about 2,000, will spend five days in one another's company at business sessions and social events. It is the only opportunity of the year for a general getting-together of electrical men and women and as such is of the greatest value to the individuals and to the whole of the industry. We stress the last phrase because we still find people who believe that the event is run by the electricity supply branch, people from other sections being a species of guest. Year by year we have done our best to destroy this notion which is an axe at the roots of the Convention. One thing which would help to bring about a better appreciation of the true nature of the gathering would be a change of name, a proposal we have unsuccessfully made on several occasions. Once again we suggest that "National Electrical Convention" would be a better title.

Turning to next week's proceedings, we note that (in addition to Sir John Hacking's presidential address) there are nine papers which will be read and discussed at four sessions. At Bournemouth last year there were eleven papers and a lecture which were disposed of in three sessions. Delegates will be thankful for the lower pressure and consequent relief from mental indigestion. The emphasis this year is on productivity—which, although some may think it has been over-discussed, is still a vital subject. The two subsidiary themes are industrial and agricultural and the papers are all by men who have intimate knowledge of the aspects with which they deal. The matter is factual and practical and will provide valuable guidance to those who have to produce equipment and the others who have to sell it—and the energy which motivates it. Little appears in the papers of a domestic character, important though this aspect is to manufacturers, contractors and the electricity authorities. This is where the Convention exhibition serves as

a counterbalance; a large proportion of the equipment on view will be for use in the home as will be seen from the advance review in this issue. We will conclude these introductory notes by expressing our conviction that the Convention will again prove of value to all who manufacture, install and sell electrical equipment, or who are engaged in supplying electricity, whether they are delegates or not.

AMERICANS "BUY BRITISH"

Last week we recorded a British company's successful tender for cable for Seattle, Washington. Now we are glad to record another British success in the United States. Ferranti's offer of six transformers at £306,000 for a hydro-electric development has been accepted by the U.S. Army. The lowest of four American tenders was still 18 per cent higher than Ferranti's. The second lowest bid was made by the English Electric Co. whose original tender for plant for the Chief Joseph Dam was recently refused. New tenders for the latter scheme were opened last week and again the English Electric's offer was lowest. It is thought in some quarters that Ferranti's success is a good augury for other British manufacturers.

UNION ELECTRICAL INDUSTRY

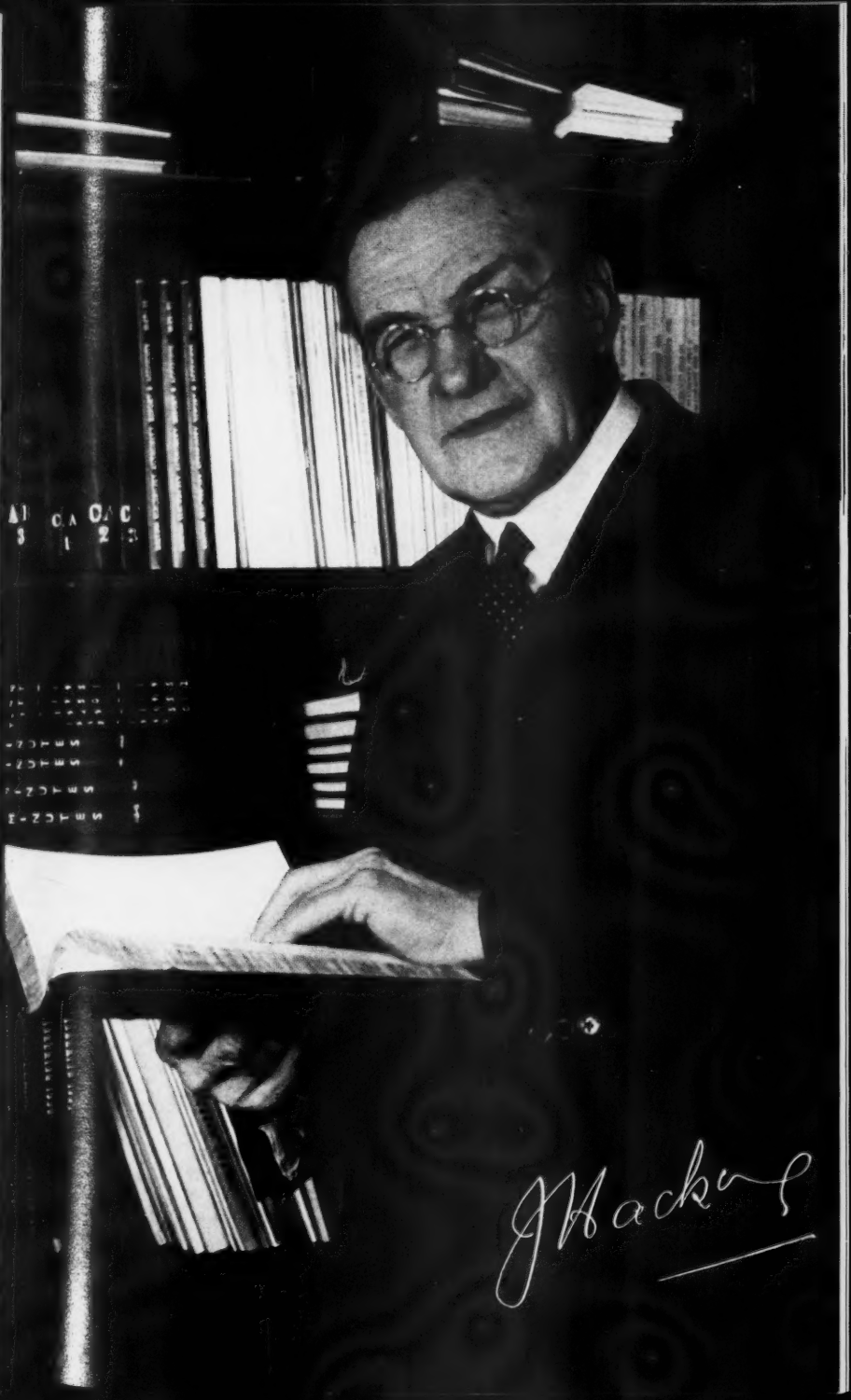
In this issue we summarize a survey of the South African electrical manufacturing industry prepared by the Board of Trade of the Union. It is probably the most comprehensive document of its kind ever produced and it should prove of great interest and use to British electrical manufacturers and exporters. Among other things the report shows how far advanced towards self-sufficiency the Union is in the various sections of the industry; the extent of the participation of British and other interests in South African electrical concerns; and the material and labour situation. One interesting conclusion by the Board of Trade is that the industry is not at present in general need of tariff protection, although examples are given of assistance in the way of import-duty rebates.

TARIFF STANDARDIZATION

One of the objects of electricity supply nationalization was the securing of greater uniformity in methods of charging. Under the former dispensation there was a bewildering variety of tariffs to meet the peculiar requirements of many classes of consumers. In the process of sweeping these away it is possible that the broom may be used too ruthlessly. Ald. E. W. B. Gill, deputy-chairman of the Southern Electricity Consultative Council, recently said that the object of making tariffs should be fairness to the consumers and not the convenience of the Board's staff. His remarks were based on the Board's decision to include churches and other special buildings along with shops, etc., in the commercial tariff.

The Convention President

Sir John Hacking, M.I.E.E., the President of the 1953 British Electrical Power Convention, whose portrait faces this page, has been a leading figure in the electricity supply world for many years. Sir John was born at Burnley, Lancs, in 1888 and was educated at the Leeds Technical Institute and University. After training with the Newcastle-upon-Tyne Electric Supply Co. (later the North Eastern E.S. Co.) he joined (in 1913) Merz & McLellan, the consultants, and while with them travelled extensively, supervising many important contracts, chiefly railway electrification. He was also responsible for construction works in Argentina, South Africa and India. At home he took part in the construction of the grid in Mid East and North-East England and he was appointed deputy chief engineer of the former Central Electricity Board in 1934, becoming chief engineer in 1944. He was a member of the Organizing Committee appointed in 1947 to prepare the way for the nationalization of the electricity supply industry and later that year was appointed deputy chairman (operations) of the British Electricity Authority, a position which he still holds. Sir John was elected vice-president of the Institution of Electrical Engineers in 1946 and was president for 1951-52. He was knighted in 1949.

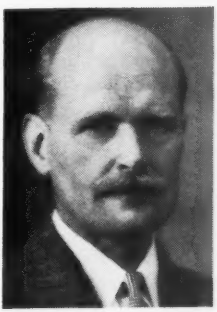


Devon Sub-Area

BACKGROUND TO THE 1953 CONVENTION

By G. T. GARWOOD, M.Sc., M.I.C.E., M.I.E.E.

(Manager, Devon Sub-Area, South Western Electricity Board)

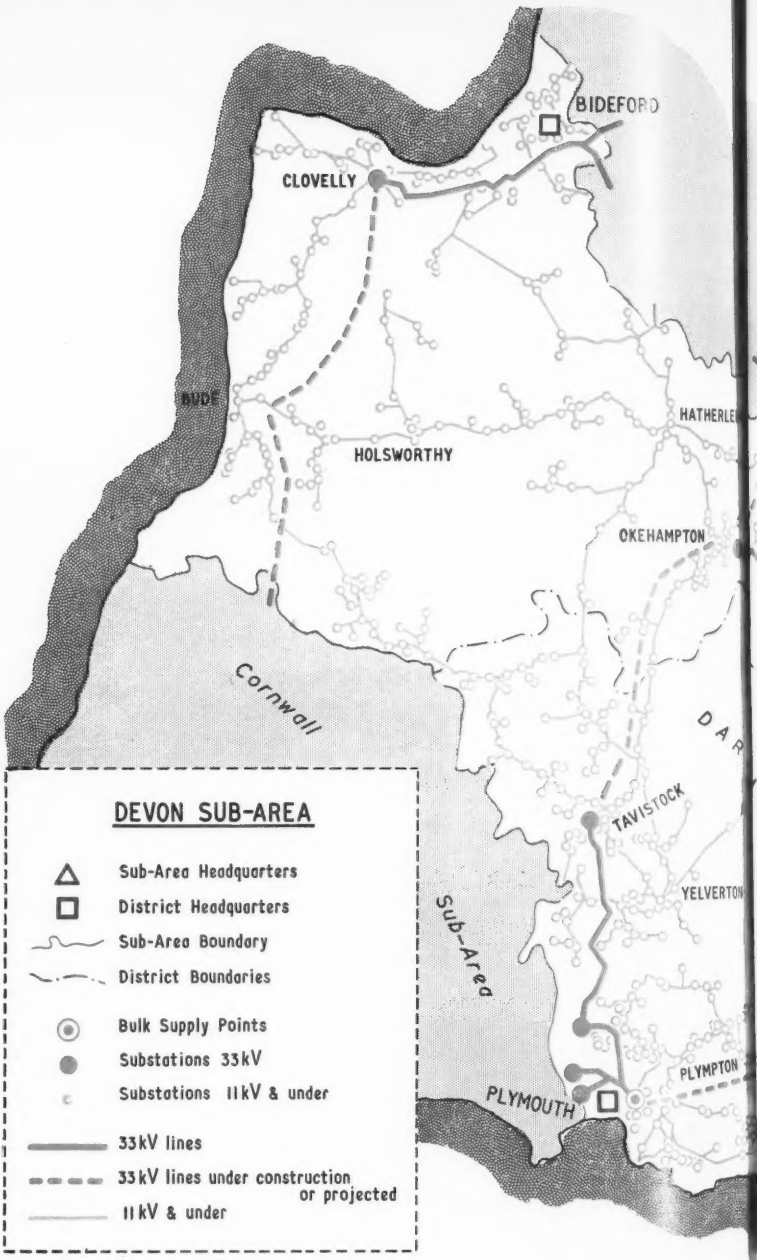


THE fame of Devon, secured by its natural amenities, by the qualities of its native population and by the deeds of its sea-heroes, and stoutly proclaimed wherever a manly baritone voice can conveniently be uplifted to remind the world that "Devon" rhymes with "heaven," needs no embellishment from the present writer. Rather, his business is with the Devon Sub-Area of the South Western Electricity Board, which, as the map on the next page shows, does not conform entirely to the county boundary. Nor does it conform entirely to the lyrical analogy just expressed, for a contrary comparison might occasionally occur to those whose job it is to plan and construct electricity supply facilities there.

Devon has had many favours bestowed on it by Providence, but that of being an ideal arena for electrical development was certainly never among them. The Sub-Area population of 660,000 is overwhelmingly concentrated on the southern littoral; the rural inhabitants are widely dispersed over inaccessible uplands; there is little industry: the soil, on the whole, is rocky and costly to excavate; and much of the surface is corrugated with severe acclivities and declivities which inflate the constructional costs and cause all but the most stout-hearted of overhead line engineers to look for employment in the Fen country.

All these factors, in their separate ways, have operated, and continue to operate, against the development of an "area service." Yet, as the map shows, great progress has been made towards the attainment of this ideal. There has, indeed, from the earliest times, been much electrical activity in Devon. The big towns, such as Exeter, Torquay and Plymouth, after passing through early vicissitudes of a pattern familiar to students of electricity supply history, have, of course, had well

A section of the Exeter–Newton Abbot 132 kV grid with Exeter seen in the background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CHAGFORD
BUCKFASTLEIGH
DEVON SUB-AREA
Sub-Area Headquarters
District Headquarters
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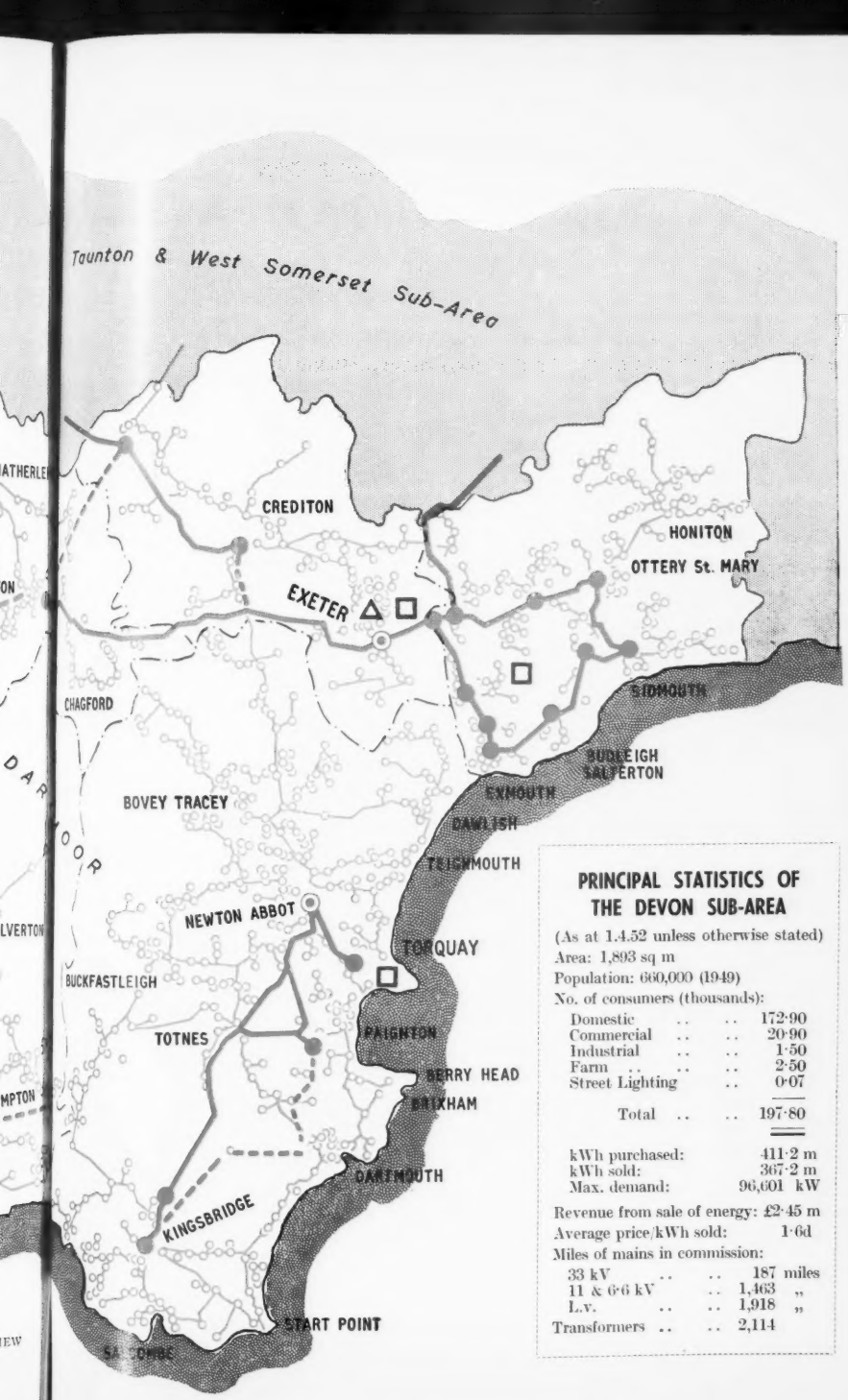
33kV lines under construction or projected
11kV & under



PRINCIPAL STATISTICS OF THE DEVON SUB-AREA

(As at 1.4.52 unless otherwise stated)

Area: 1,893 sq m

Population: 660,000 (1949)

No. of consumers (thousands):

Domestic	172·90
Commercial	20·90
Industrial	1·50
Farm	2·50
Street Lighting ..	0·07
Total	197·80

kWh purchased:	411·2 m
kWh sold:	367·2 m
Max. demand:	96,601 kW

Revenue from sale of energy: £2·45 m

Average price/kWh sold: 1·6d

Miles of mains in commission:

33 kV	187 miles
11 & 6·6 kV ..	1,463 „
L.v.	1,918 „
Transformers	2,114

developed undertakings for many years. But, in addition, there was quite an extraordinary number of small statutory and non-statutory undertakings, whose later consolidation and development by the Whitehall Securities group, by Torquay Corporation and by the Christy group, accounted for most of the area supplied up to vesting day.

The present-day picture is of a territory in which supplies are available to substantially the entire urban, and to 70 per cent of the rural, population. The parts still without service are, with few exceptions, incapable of being supplied, while costs remain at their present level, except by a process of subvention that the Board is at present unable to support from its internal resources. The few exceptions are being dealt with just as quickly as the necessary capital can be made available.

Organization

The Sub-Area is organized into the following five "single-headed" Districts: Exeter (200 sq miles, 30,000 consumers); East Devon (225 sq miles, 16,500 consumers); Plymouth (359 sq miles, 83,800 consumers); Torbay (495 sq miles, 61,400 consumers); and West Devon (620 sq miles, 14,400 consumers).

These Districts, with their Branches (and in some cases, Sub-Branches), are the main executive units of the Sub-Area. They are supervised, co-ordinated and controlled by the Sub-Area headquarters, which also provides central services under all the main functional heads. In this organization, the cardinal principles observed, in conformity with the general policy of the Board, have been the devolution of executive authority to as near to the consumer as possible and the preservation of a single channel, passing from manager to manager down the line, for the formal exercise of that authority. The parallel or functional channels are used fully and freely, but they are reserved for their proper purposes. The manager at each level is thus assured of an authority commensurate with his responsibility and the fullest scope for co-ordinating all activities at his level.

The Sub-Area headquarters is situated, appropriately enough, in the county town and ancient cathedral city of Exeter and is housed in an office which, though not without solidity, and even some distinction, was converted from a brewery office and bottling warehouse. Visitors will find this office overlooking the old city wall, hard by the site of the North Gate; but they will miss the faint, lingering fragrance of beer, which has now vanished, after long pervading it.

They will also have an opportunity of seeing the splendid progress that is being made in rebuilding the bombed centre of the city. It is an impressive token of the vitality of a town that was old when the English came to England. The past, indeed, crowds in on the visitor to Exeter. From the point where the Sub-Area office stands by the North Gate, the old city wall may be traced for nearly its whole length. Within its perimeter, many old buildings survive, not only the Guildhall and the

Reconstruction in progress in Exeter's blitzed city centre. The ancient cathedral survives. —*Photo by courtesy of the Western Morning News*

New Plymouth : Royal Parade, one of the new main shopping streets.—*Photo by courtesy of the Western Morning News*

lovely little red sandstone churches of the guide books, but many an ancient shop, hiding perhaps behind a modern commercial frontage, but self-revealing from the opposite side of the street, or from inside. The back streets near the city centre are perhaps the best for these; and when they are crowded by the farming folk coming in on Fridays, with their rich Devonshire burr, it is easy to close one's eyes and to imagine oneself back in the press and bustle of a medieval town. But this is pure digression.

The District headquarters are situated in Exeter, Plymouth, Torquay and Bideford respectively. In the locality of these towns, the District organizations normally discharge, not only their own special functions, but also the functions that would otherwise be performed by a local Branch organization. This arrangement has some disadvantages, but in view of the executive character of both Branch and District functions, it is eminently workable and has an expediency value that cannot be ignored. In the smaller towns, the typical organization is the Branch. Branches in Devon vary from large ones based on the urbanized seaside resorts, and serving over 9,000 consumers, to those situated in the inland market towns, with less than 10 per cent of the number of consumers, though spread, maybe, over a larger territory.

In the writer's opinion, the single-headed Branch, as exemplified in rural Devon, is potentially one of the most satisfactory media through which a large regional organization like the Board can possibly make contact with the public. The whole of the activities of the Branch (predominantly commercial, but comprising aspects of all the executive functions) are within the personal supervisory capacity of the Branch manager, who, being well known in his locality, is thus in a position to compete on all points, including that of public relations, with an efficient local business under the personal supervision of the proprietor. The implied ideal is capable of being closely approached under the organizational policy previously mentioned.

Where dictated by considerations of logistics, Sub-Branches are established in charge of Sub-Branch managers, living, typically, over or alongside a small service centre, and assisted by a small but versatile manual staff. In these little units wonderful opportunities exist for translating a big organization into terms of a single human personality — a known and respected member of a small community, and the trusted arbiter of all things electrical.

Engineering

At vesting day, the Board acquired in what is now the Sub-Area the distribution networks of four municipal and thirteen company undertakings. They represented

much diversity of system and method, but shared a common wartime legacy of arrears of maintenance and development. Much work has been done in uniting and reinforcing these networks by the construction of a new 33 kV backbone, and by reinforcing and extending the 11 and 6·6 kV and l.v. systems. The map shows the h.v. network as it now appears.

The outstanding job in progress is the laying down of a new distribution network in the blitzed city centre of Plymouth, the reconstruction of which is proceeding rapidly. The old 6·6 kV and l.v. systems in the centre were either destroyed by Nazi bombs or rendered useless by the adoption of a completely new street plan and they are being replaced by a new 11 kV and l.v. network supplied from three primary 33 kV substations. This job was described in prospect in a notable article in the *Electrical Review* of 24th November, 1944, by the then city electrical engineer and present deputy chairman of the Board, Mr. H. Midgley; and it was further described—this time in progress—in an editorial article in the issue of 18th April, 1952. It need only be said here, therefore, that it is keeping fully abreast of the general reconstruction, in which Plymouth leads the country. A similar but smaller scheme is in progress in Exeter, where rapid strides have been made with the reconstruction of the city centre in the last two years.

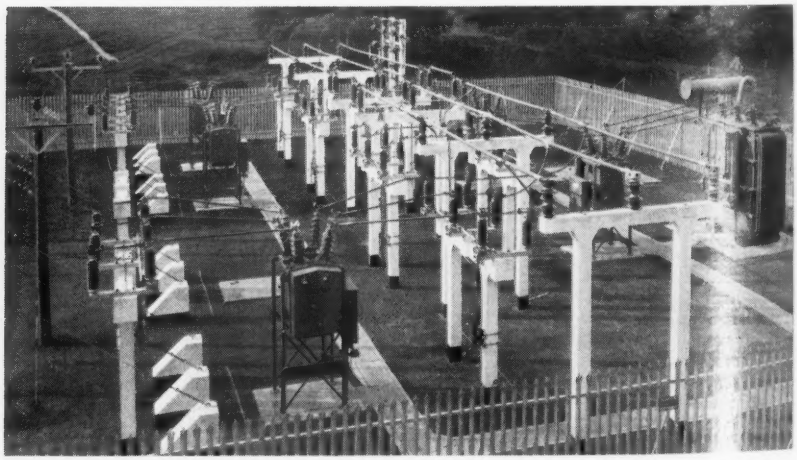
In other places, less spectacular revolutions are in progress in the supersession of out-dated distribution systems. Torquay is replacing its old 2 kV single-phase network by 11 kV, three-phase, in stages, as opportunity offers. Bideford has gone further in getting completely rid of its old 3 kV system, and replacing it by 11 kV.

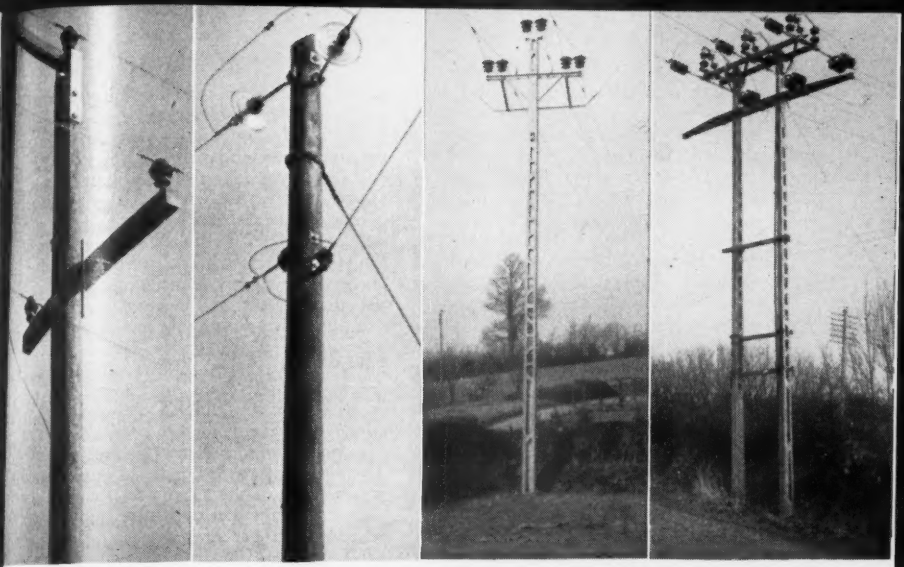
At Brixham there is a d.c./a.c. changeover scheme in progress, where 1,700 consumers have been changed over to date. The remaining 500, it is hoped, will be changed over this year.

The 33 kV extensions recently completed include a submarine crossing of the River Tamar close to Brunel's great bridge at Saltash, by which a supply is given to East Cornwall. (This was reported in the *Electrical Review* of 18th April, 1952.) Another 33 kV submarine cable has been laid across the River Dart as part of the ultimate Paignton–Kingsbridge circuit. A 33/11 kV substation has lately been commissioned at Bideford. This substation will derive its supplies from the new East Yelland power station, now under construction, and will distribute them over the whole of north-west Devon and the Bude area of Cornwall. The substation has 33 kV links with Exeter and Barnstaple.

Apart from those to which reference has already been made, the urban parts of the distribution system contain no features likely to be of special interest to delegates,

33/11 kV outdoor substation at Bideford which supplies the north-west corner of the Sub-Area





Left: **11 kV "autoguard" line near Buckfastleigh.** *Right:* **6·35 kV phase-neutral angle pole**

Examples of 33 kV concrete pole construction near Dunsford

though visitors to Plymouth will note that energetic steps are being taken to bring the street lighting there up to date. Some 3 miles of h.p.m.v. lighting has been installed in the last two years, and another 3 miles has been approved and is under construction. Fluorescent lighting is standard in the City Centre and in other shopping areas. In Exeter, too, promising beginnings have been made with the modernization of the street lighting.

In the rural areas generally, the palm for special interest, in the writer's opinion, goes to the old West Devon Company's scheme, now incorporated partly in the West Devon District of the Board, and partly in the Plymouth District. This scheme, involving the consolidation of several small non-statutory undertakings; the construction of a rural network to cover a thinly populated area of 830 sq miles; the ingenious adaptation and utilization of old mining water rights and a disused canal; and the construction of two hydro-electric stations at Morwellham and Mary Tavy, the latter the largest in England, will long be remembered as a testimony to the foresight, courage, commercial acumen and engineering skill of its promoter, Mr. Frank Christy.

The scheme was described in detail in the *Electrical Review* of 27th May, 1938, when the I.M.E.A. Convention was held at Torquay. The power stations at Mary Tavy and Morwellham, together with the water supply arrangements, are well worth a visit.

Convention delegates interested in overhead lines may observe some notably well-designed and constructed concrete-pole lines in the area of the old Whitehall Securities companies. There are also some 6·35 kV phase-neutral schemes, constructed on the plan advocated by the writer in a recent I.E.E. paper and elsewhere. The nearest of these schemes to Torquay is one under construction at Down St. Mary, some five miles distant from Crediton.

A distinct novelty in this country is an "autoguard" 11 kV line now being built just east of Buckfastleigh. This type of line, in which one of the power conductors is made to serve as a lightning guard to the others, was described by the writer in the *Electrical Times* of 29th May, 1947. An illustration is given of the experimental pole-top design employed, showing, in particular, the discharge gap and the wooden outrigger carrying the down lead.

Operating conditions on the whole are easy in Devon, with some exceptions, arising notably from the exposure of the north-western corner of the county to Atlantic blizzards. These, on occasions,

can produce snowfall and icing conditions comparable with anything in the country. But gales are the more common enemy on the Atlantic seaboard. (The salt spray they carry would be more of a menace if it were not for the high rainfall.) Commenting on an old brochure, published in 1908, by the Bude Electric Supply Company, in which it is stated that " the great advantage of the Electric Light is that it is unaffected by *Wind*," Mr. W. J. Oxenham, manager of the West Devon District, dryly observed that after many years' operating experience in the locality, he found the statement one to which he could not wholly subscribe.

Trade and Industry

In the modern industry of Devon, the traditional pattern stands out strongly. In the old days, the dominant features of that pattern were farming, wool, fishing, ship- and boat-building, china clay, mining, quarrying and paper-making. These industries remain, modernized and electrified, but still the basic activities. In more recent times have been added miscellaneous light industries, principally in Exeter and Plymouth; the big catering industry of the coastal resorts; and, of course, the distributive trades.

In an era of planning, the ineluctable factors of soil and climate still regulate the farming of Devon. To the casual visitor—and this usually means a visitor to the South coastal resorts—the rich, red soils of the sandstone measures, the cosy-looking cob farmhouses tucked away in some sheltered fold of the land, with their pink or cream-coloured walls and thick roofs of thatch, and their vastly solid and extensive outbuildings, all combine to suggest the height of snug self-sufficiency and prosperity. But this picture is incomplete.

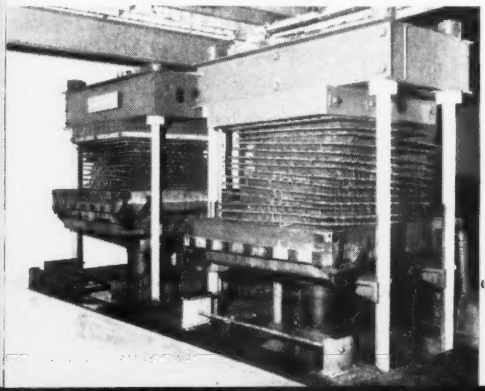
Although the lowlands are well-drained, fertile and suited to mixed farming, dairying and market-gardening, they represent only a fraction of the total area. Apart from the valleys around Exeter, Newton Abbot and Bideford, and the coastal belt of South Devon, nearly the whole of the Sub-Area is more than 400 feet above sea-level, and on the sour, intractable culm measures of the uplands the main concentration is necessarily on stock rearing. Moreover, no less than a fifth of the total area of the county is only rough grazing or moorland. The whole of Dartmoor lies within the Sub-Area boundary. Many of the smaller farms, too, with their picturesque but outdated farm buildings, are worked by family units, with limited capital, and this does not make for efficient modern farming. The National Farm Survey of 1941 showed 70 per cent of the Devon farms to be less than 100 acres in extent, and only 13 per cent over 150 acres.

Nevertheless, farming in Devon has made notable progress, the production of milk, for example, having more than doubled between 1939 and 1952. Cattle and poultry have substantially increased and there is a steady recovery in sheep and pigs. In general, natural conditions of climate and soil are favourable for livestock farming and the production of cheap feed from grassland. These are conditions under which electricity can be of great benefit to the farmer, particularly in dairying, small-scale grass and grain drying, pig and poultry rearing, feed preparation, and in the farmhouse. Since the capacity of individual appliances is small, cheap single-phase distribution is eminently suitable.

The business of affording supplies to the farming community is, of course, a major preoccupation in the Devon Sub-Area. Owing to the wide dispersal of the farms over the uplands of central Devon, the capital cost of making supplies available is high. In the rural parishes of the Sub-Area there are fewer than 33 premises of all kinds per square mile, and the average capital cost for 100 per cent service was estimated in 1949 at £173 per consumer. It would be nearer £300 now.

For reasons already indicated, development is proceeding on the basis of a gross minimum return of 20 per cent on capital. When the estimated second-year's revenue from group schemes is less than this figure, as it invariably is, the

Pressing cyder at the Whiteways establishment at Whimple, East Devon. Approximately 275 h.p. of motors are installed here.—*Photo by courtesy of Whiteways Cyder Co., Ltd.*

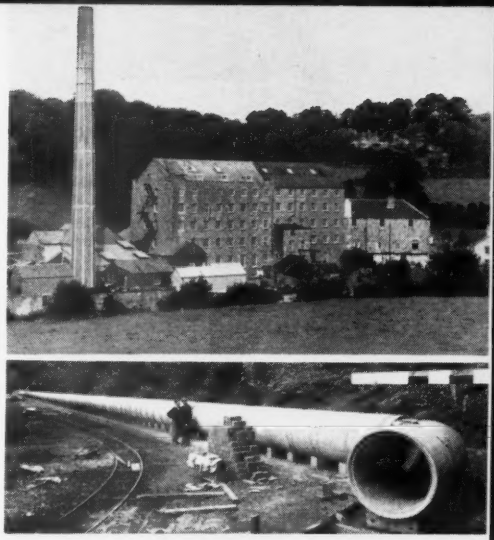


balance is charged as a line rental, apportioned among the participants on an agreed basis. The line rental is progressively reduced as revenue develops beyond the estimated figure.

Notwithstanding all difficulties, progress has been rapid. To-day 2,750 farms in the Sub-Area have supplies, 300 having been connected last year. But 5,050 remain to be served. Although there is a tendency for many farmers to be content with using the supply in the farmhouse only, the Sub-Area boasts many model farm installations and many well-equipped farmhouses.

After agriculture, the woollen trade was, of course, the ancient staple of the West. The production of wool grew naturally out of the important position of the sheep in the traditional organic farming of the region. The production of woollen cloth followed equally naturally from the general availability of water power in the small quantities that sufficed for the times. But although even the memory of the once famous "Exeter serges" has nearly vanished, a number of the old woollen mills of Devon have adapted themselves to changing conditions, and have grown into modern establishments taking up to 2½ million kWh a year. One of the more picturesque of these mills is that of John Churchward & Sons, of Harbertonford, about three miles south of Totnes. The building is a typical Devon woollen mill and dates from the Napoleonic period, when the mill turned out large quantities of serges for the Admiralty—as well as woollen material for the saddlery and horse clothing trades. Power was originally derived from the River Harbourne: it is now taken from the Board. The output, too, has undergone a similar adaptation to modern needs, for the mill now produces a wide range of dress materials, botany woollen goods and "West of England" tweeds. The mill dyes its own yarn and, as a speciality, produces the woven felts used in the piano trade.

Another interesting mill, dating from about 1750, which will be seen by delegates visiting Buckfast Abbey, is that of the Buckfast Spinning Company, close to the Abbey. The mill chiefly produces blankets and rugs and yarn for carpet manufacture, and originally derived all its power from the River Dart. It is now, at the time of writing, powered by a 300 kW water turbine-generator, supplemented by a



John Churchward & Sons' woollen mill at Harbertonford is a typical West Country mill originally driven by water power. *(Below)* **A sewerage pipe line under construction by the Teign Valley Concrete Co., a large user of electricity**

400 b.h.p. Paxman-Lenz tandem compound steam engine which drives a slow-speed Crompton generator. Motor generators convert the d.c. output of the power plant to a.c. for driving the modern mill machinery. It must be recorded, not without a twinge of regret, that this fine engine is doomed, for the Board is now arranging to afford a supply. The mill will require some 400 kVA.

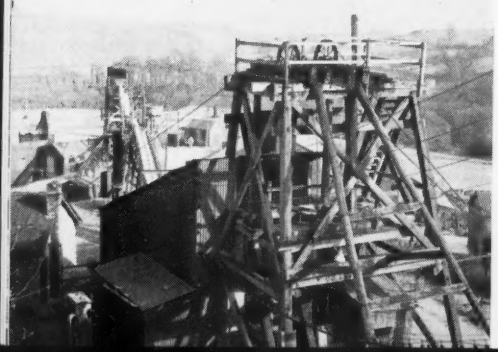
Other Devon industries to which electricity has made itself indispensable are mining and quarrying. Nowadays Devon hardly ranks as a mining county, though it has some very uncommon mines. In past times it produced iron, copper, tin, silver, lead and possibly some gold. The rich silver-lead mines of Combe Martin contributed largely to the war expenses of the Plantagenet kings, and later were one of the sinews of Elizabethan sea power. More recently, the same mineral was produced in the Mary Tavy district, north of Plymouth, and in this district copper and tin were mined well within living memory. Manganese ore, used then in glass manufacture, was mined in the Teign Valley and elsewhere in Devon in the 18th and 19th centuries.

Incidentally, it was quite probably Devonshire mining, rather than Cornish, that gave rise to the steam engine. Devon,

of course, is the birthplace of steam power. Captain Savery of Shilston, near Modbury, patented his pumping engine—a crude form of Pulsometer pump—as long ago as 1698, in the reign of William and Mary; and it was no doubt from a contemplation of the limitations and latent possibilities of this contrivance that Thomas Newcomen, the blacksmith of Lower Street, Dartmouth, produced the world's first reciprocating steam pumping engine, during the reign of Anne. Many engineers to whom Newcomen's work is familiar hardly realize its antiquity. His engine was a fully self-acting machine, with its growing pains behind it, certainly as early as 1715—over 20 years before Watt was born and 56 years before the birth of Trevithick.

But present-day mining activities in Devon are no mere survival of the past. On the contrary, they are modern industries catering for modern needs. First in seniority and importance is china and ball clay. China clay in Devon comes exclusively from open workings at Lee Moor, near Plympton; but on the north-west Devon plateau, between Torrington and Hatherleigh, ball clay is mined in underground workings extending down, in some cases, to 150ft. The clay is excavated by pneumatic shovels, and electricity is used for driving the compressors and for haulage and pumping purposes. There are similar ball-clay workings in the Bovey basin, near Newton Abbot, where, in addition, clay is won by surface workings. To the casual visitor, these workings, with their crude-looking surface tackle (most things look pretty crude when they are smeared with clay), might be mistaken for the outward signs of a backward industry. The impression would be entirely illusory: the industry is right abreast of the times, and visitors should be prepared to encounter erudite specialists on site who, if provoked, are quite prepared to discuss deflocculation coefficients and other technical mysteries.

Barium sulphate mine at Bridford owned by the Malehurst Barytes Co., Ltd.



At Bridford, in the Teign Valley, and easily accessible to delegates, is a barytes (barium sulphate) mine, owned by the Malehurst Barytes Co., Ltd. Mining is carried out by underground workings, at a depth of 500ft, and with galleries extending over 1,200ft. The mine takes some 400 kW from the Board for pumping, winding, washing, screening, etc. It also has its own electrically-driven sawmill for producing mine timber. The annual output is about 20,000 tons; and the product, a white, inert compound, has a remarkably wide range of application in industry. It is used in the manufacture of paint, paper, plastics and medical preparations, among other things.

Another rare kind of mine in the Teign Valley is the micaceous iron oxide mine of the Ferrubron Company at Hennock. Records show that this uncommon substance was mined here by opencast methods as long ago as the 18th century. Now the main adit penetrates the hillside for three-quarters of a mile. By far the largest demand for this product is for the manufacture of high-class, rust-resisting paint, to which the Eiffel Tower, Sydney Harbour Bridge and other important structures owe their protection. The mine produces and refines about 600 tons of the oxide a year, much of which is exported. It takes about 100 kW from the Board for driving compressors, screens and a rotary dryer.

Quarrying is extensively carried out in the Sub-Area, owing to the high quality of the limestone and granite found in various parts. An example of special interest is the Berry Head limestone quarry near Brixham. This quarry produces graded road-metal, screened aggregate for concrete making and industrial limestone for the iron and cement industries. Berry Head is one of the few large quarries from which the products are loaded straight into ships. In 1950, the machinery was converted from diesel to electric drive, and the quarry now has about 1,000 h.p. of motors installed. So far as possible, the product is mechanically handled from the quarry face to the holds of vessels.

Ship-building proper in the Sub-Area is chiefly concentrated in the Naval Dockyard at Devonport, which takes a supplementary supply of some 3,000 kW from the Board;

but smaller shipyards, and numerous yacht- and boat-builders, exist around the southern ports and harbours. Phillip & Sons' shipyard at Dartmouth may be mentioned as a single example of exceptional interest, for here are built not only naval auxiliary vessels and the like, but also such odd craft as lightships and chain ferry steamers. The celebrated non-magnetic ship *Research* was built here for the Admiralty. The shipyard is one of the Board's power consumers.

In this brief account of some of the more interesting aspects of Devon industry, space must be found for a reference to the big catering industry of the coastal resorts. Delegates will have an excellent inside view of this industry at the place of its highest development—the "glittering *plage*" of Torquay, where it can be claimed, incidentally, that no small amount of the glitter is contributed by the wonderful electrical illuminations of the cliff gardens. The hanging gardens of Babylon had nothing like it.

For the rest, the paper factories and creameries, the potteries and brickworks, the cyder factories and the light speciality industries of Plymouth and Exeter must go without further mention. In practically all cases, these industries are substantially aided, if not completely dependent on, the Board's service; and if in the aggregate they amount to less than might be desired from a load-building point of view, they nevertheless represent important features of the economy of the localities in which they are established.

* * *

In this article the writer has deliberately omitted, as inappropriate to the occasion, all reference to the many problems that beset the progress of the Devon Sub-Area in common with that of the South Western Board, and of the industry. He has, in fact, attempted nothing more than to conduct the senators of the industry attending the Convention on a sightseeing tour of the vicinity of their temporary senate house. In so doing, he has tried to avoid rival guides carrying the conventional guide-books and to cater for the well-known taste of members of the engineering profession for diversions savouring of busmen's holidays. If he has succeeded in that, he will have achieved his purpose.

One of the largest limestone quarries in the country at Berry Head; nearly 1,000 h.p. of motors are installed.—*Photo by courtesy of the Torquay Times*

Power Convention Programme

Business Sessions and Social Events

THE fifth British Electrical Power Convention, under the presidency of Sir John Hacking, deputy-chairman (operations) of the British Electricity Authority, begins at Torquay on Monday next and ends on the following Friday. We give below brief details of the daily activities which have been arranged:—

Monday, 8th June

Callard's Café. 1 p.m. Torquay Rotary Club Luncheon.

Torwood Garage. 8.30 p.m. Official opening of the Exhibition by the President.

Tuesday, 9th June

Pavilion. 10 a.m. Civic welcome by the Mayor of Torquay followed by the Presidential address.

Pavilion. 2.30 p.m. Paper on "Electricity and National Prosperity" by Col. B. H. Leeson, O.B.E., T.D., Pres. I.E.E. and director of the British Electrical and Allied Manufacturers' Association, followed by discussion.

Imperial Hotel Lounge. 3–5 p.m. Ladies are invited to take tea with Lady Hacking. Film show and floral decoration display.

Assembly Hall, Town Hall. 8–8.30 p.m. Joint reception by the Mayor and Mayoress of Torquay and the President and Lady Hacking, followed by a dance.

Wednesday, 10th June

Pavilion. 10 a.m. Papers on "Electricity and Industrial Production" by Mr. E. R. Wilkinson, M.I.E.E., M.I.Mech.E. (B.E.A.); "Electricity Supplies for Industry" by Mr. A. O. Johnson, B.Sc.Tech., A.M.I.E.E. (North Western Electricity Board), and Mr. C. P. Holder, B.A., A.M.I.E.E. (Metropolitan-Vickers Electrical Co., Ltd.); "Combined Electricity and Heat Supplies" by Mr. H. S. Prosser, A.M.I.E.E., A.M.I.Mech.E. (B.E.A.), and Mr. A. W. Pedder, B.Sc., M.I.E.E., M.I.Mech.E. (Merz & McLellan); and "Industrial Applications of Electricity" by Mr. T. B. Rolls, B.A., A.M.I.E.E. (McLellan & Partners), followed by discussion.

Town Hall. 12.15 for 12.30. Luncheon organized by the Electrical Association for Women.

Haldon Pier. 2.45 p.m. Cruise to River Dart (return to Torquay 6.30 p.m.).

Thursday, 11th June

Pavilion. 10 a.m. Continuation of Wednesday morning's proceedings.

Pavilion. 2.30 p.m. Papers on "Electricity and Food Production" by Mr. S. F. Steward, C.B.E., M.I.Prod.E. (chairman, South Western Electricity Board); "Electricity for Agriculture" by Mr. C. A. Cameron Brown, B.Sc., M.I.E.E. (B.E.A.); "Electricity for Horticulture" by Mr. A. W. Gray, Associate I.E.E. (B.E.A.); and "Electrical Equipment for Food Production" by Mr. F. E. Rowland, M.I.E.E. (G.E.C.), past-president, Institution of British Agricultural Engineers, followed by discussion.

Imperial Hotel. 7 for 7.30 p.m. Annual dinner. Principal guest, Sir Archibald Forbes, President, Federation of British Industries.

Assembly Hall, Town Hall. 8 p.m. to 12.30 a.m. Dance and cabaret. (During the evening the "Lady Citrine" and "G. P. Dennis" Golf Trophies will be presented to the winners.)

Friday, 12th June

Pavilion. 10 a.m. "Electrical Forum." 11.30 a.m. Annual general meeting and conclusion of Convention.

The Convention office at the Pavilion will be open daily from 10 a.m. to 12.30 p.m. and 2 to 5 p.m. but will close at noon on the Friday.

Admittance to the Exhibition on the Tuesday will be confined to Convention delegates and ticket holders (10 a.m. to 6 p.m.). The general public will be admitted on subsequent days.

As we have already reported, the competitions for the "Lady Citrine" and "G. P. Dennis" Golf Trophies will take place on Wednesday, 10th June. Particulars are obtainable from the hon. secretary, Mr. W. J. Bird, Imperial Hotel, Torquay. Proceeds will go to the funds of the Electrical Industries Benevolent Association.

The following are the organizations which are responsible, through the Council, for the Convention, the names of their representatives being shown in parentheses:—

Association of Consulting Engineers (Mr. J. R. Beard); British Electrical and Allied Industries Research Association (Mr. H. Astbury); British Electrical and Allied Manufacturers' Association (Col. B. H. Leeson); British Electrical Development Association (Mr. H. Nimmo); British Electricity Authority and Area Boards (Lord Citrine, Mr. W. N. C. Clinch, Mr. L. Howles, Alderman W. S. Lewis, Mr. H. Nimmo, Mr. V. A. Pask and Mr. S. F. Steward); British Refrigeration Association (Mr. E. G. Batt); Cable Makers' Association (Sir John Dalton); Electric Lamp Manufacturers' Association (Mr. W. J. Jones); Electrical Association for Women (Dame Caroline Haslett); Electrical Contractors' Association (Mr. L. C. Penwill); Electrical Contractors' Association of Scotland (Maj. J. L. Drummond); Electrical Wholesalers' Federation (Mr. A. B. Wildsmith); Employees' National Committee (Mr. A. M. F. Palmer); Institution of Electrical Engineers (Mr. T. G. N. Haldane); National Register of Electrical Installation Contractors (Mr. R. Birt); Electricity Undertakings in Northern Ireland (Mr. A. W. Ferguson) and Water-Tube Boilermakers' Association (Mr. K. J. McKillop). The secretary is Mr. J. W. Simpson.

Convention Exhibition

A Wide Range of Equipment on View at Torquay

WITH over a hundred manufacturers participating, the exhibition being held next week at Torwood Garage, Torquay, in conjunction with the British Electrical Power Convention, probably provides, despite the restrictions in space, the year's most representative display of purely electrical equipment. The exhibition has a particularly strong representation of appliances for the home, an aspect which should have an especial appeal in view of the more favourable prospects for a renewal of domestic development.

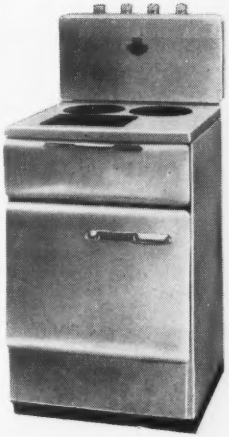
Progress that has been made by the electricity supply industry in the five years since vesting day with this end in view is illustrated on the British Electricity Authority's stand with the aid of pictures, descriptive copy and a "screenoscope." The South Western Electricity Board's exhibit portrays the progress in rural development, particularly farm connections, which have risen from 817 in 1949–50 to the record figure of 1,279 in 1952–53. Outstanding developments which have taken place in the electrical industry during the 80 years of the *Electrical Review's* existence are depicted on Stand 95 by a series of enlarged reproductions of pages from the journal.

It cannot be said that there are any really sensational innovations making their appearance but there are quite a few new products and several interesting trends of design to be seen. There is, for example, a striking departure from conventional cooker design in the new Revo "Monarch" model (illustrated) which incorporates a high splash plate with all the controls mounted on the top. By the undoing of two screws this splash plate folds down behind the cooker for transport, while removal of the front of the plate affords ready accessibility to the switch box and wiring. The control knobs, which with a topical touch are reminiscent of crowns, are found particularly convenient as well as being out of reach of children. The knob relating to the thermostatically controlled oven incorporates a pilot lamp to indicate when the desired temperature has been reached.

The extra width afforded by not having to house switches at the side of the oven gives a capacity 15¾in wide by 14in high by 13½in deep. The oven loading is 2·1 kW. Two 8in boiling plates and a 10in by 8in grill-boiler provide adequate hob equipment for the large family.

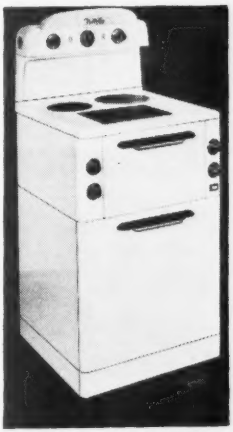
With a two-tone ivory vitreous enamel finish and polished handle and switches in ivory and scarlet, the cooker is very attractive in appearance. It is claimed that this cooker fulfils most of the points recommended in the Electrical Association for Women's "Towards Perfection" booklet.

Tricity, Ltd., re-enters the large cooker market with a new three-plate model, the "Queen" (illustrated). Its many novel features include automatic switching. Also shown is a low priced four-plate two-oven Tricity cooker which can be built on the unit plan. G.E.C. cookers shown include the popular DC114 and two cookers from the economy range.



Revo "Monarch" cooker marks a striking departure from conventional design

Tricity, Ltd., re-enters the large cooker market with this new "Queen" model



The main Belling cooker display is of the 46/47 series and the 64AB streamline cooker with oven lighting, inner glass door and wheels for easy moving. The whole of the "Baby Belling" range is also on view. British National Electrics, Ltd., show their de luxe cooker and also two low-priced models particularly recommended for electricity supply undertakings and housing authorities.

An addition to the "Creda Comet" range of horizontal-type electric cookers, the "Super Comet," has a time switch, clocks and dials fitted on a central panel mounted at the back of the cooker, a colour signalling code telling the housewife the temperature to which the oven, grill or boiling plates have been set. A concealed light illuminates the hob which has four radiant type boiling plates.

The Jackson "Two-Ninety" cooker is of original and contemporary design with a pleasing appearance and a modest price. It incorporates a light-weight lift-off hob, hand level controls, built-in towel rails, rollers on back legs, and unit construction wiring assembly. Good cooking visibility with easier cleaning are provided in the new 194J model by means of the new "Clear-view" inner glass oven door combined with the "Cleanlite" cream splash oven interior. Both the 192J and 194J cookers now have these refinements fitted as standard at no extra cost. The 191J low-priced cooker has an extra large oven. The 69 "Giant" cooker is now available at a reduced price.

On their stand Hague & McKenzie, Ltd., emphasize the quality, range and suitability of "Pyramid" hollow-ware. Ground-base utensils for electric hot-plates include milk saucepan with a fitted lid; porringer-saucepan with interchangeable lid; dual-purpose batch egg poacher/pudding steamers, and grill-frypans.

In view of the recent safety regulations emphasis in fire design is concentrated particularly on guards. Following the now well known "Safera" model Ferranti, Ltd., has brought out a new range of portable (illustrated), panel and wall fires of up-to-date design, all fitted with guards complying with the regulations. The correct application of the principle of the parabola to electric heating ensures that the fires provide instant radiant heat with complete physical comfort. Safety guards have been introduced as extras by H.M.V. Household Appliances for their "Bruton de Luxe" (illustrated), "Welbeck" and "Portman" fires.

To obtain the dispersal of heat required by the new regulations Bulpitt & Sons, Ltd., have redesigned their "Waldorf" 1 kW fire with a deeper, corrugated aluminium reflector and, of course, an appropriate guard. The pressed seamless reflector is tone enamel finished in cream or green. In another completely new model the guard has been incorporated as an integral part of the attractive design.

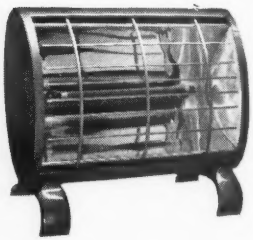
All the Premier fires are now fully protected and in addition special care is being taken in the design of the latest models to minimize risk of knocking over. Typical of this is the recently introduced "Guardian" 2kW model (illustrated), which incorporates wide well-balanced feet with a "scorchless" handle. Its modern design, which is based on an oval cross-section, fits elegantly into almost any setting.

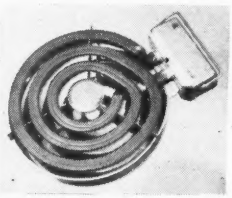
A Coronation year theme has been chosen for the Berry's Electric display which is devoted to examples of "Magicoal" fires, including the "York Adam," the "Wilton," the "Queen Anne" pedestal and other models which are used in the Royal homes and in state buildings throughout the world.

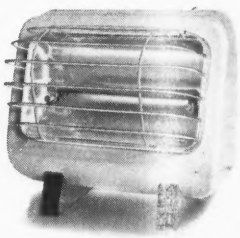
For nurseries, bathrooms or any other situations where complete safety is required the Bratt Colbran "Safeglow" overhead flood heater has a special appeal. With it are various other designs of "Solectra" portable fires (illustrated), convectors and the "Sunrise" fire which provides a lifelike illusion of a coal fire.

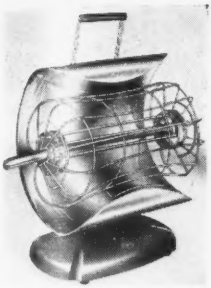
Oil filled radiators are making an increasingly strong appeal both on account of their efficiency and safety. Like other heating equipment too their sales are likely to be helped by the lowering of the purchase tax. The new Dimplex "Coronation" model is particularly suitable for installation under low windows. Sixteen different models of the Hurseal oil filled column and wall panel radiators are on view, together with the new T.V.½ and T.V.1 portable panel radiators, unit heaters, oil filled towel rails, washable electric bed sheets and insulation

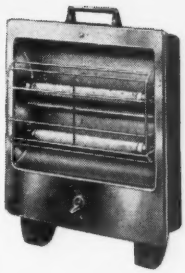
Left: **The Premier "Guardian" fire incorporates wide well-balanced feet with a "scorchless" handle.** *Centre:* **Backer 8in twin circuit single tube boiling plate.** *Right:* **Bulpitt & Sons' redesigned "Waldorf" fire**

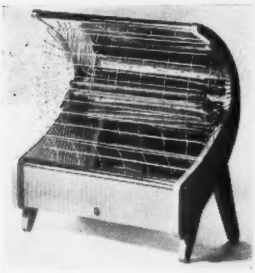












Left: **H.M.V. " Bruton de Luxe " fire fitted with new guard.** *Centre:* **Bratt Colbran No. 253 portable fire.** *Right:* **Ferranti F311 2 kW fire available in silver and copper finishes**

material. A new Hurseal facility now available is draught-proofing and weather-stripping. The B.N.E. model P20 portable convector is suitable for almost any type of room. New Thermovent heaters have an improved duct system giving greater efficiency with cooler cases and grilles.

For off-peak heating in offices, shops, etc., the G.E.C. has developed an electric storage heater with two special elements (1,500 W) time-switch controlled to heat 480 lb of special concrete (in ten blocks in an attractive sheet steel case). The heat is given out over the 24 hours.

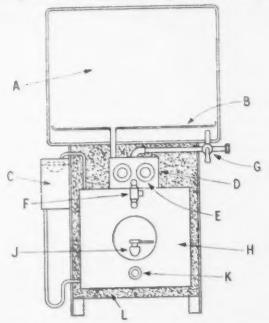
With such a comparatively few whistling kettles on the market the " Fanfare," the most recent introduction of Best Products, Ltd., is of particular interest. Of chromium plated copper, it has a capacity of 4 pints and a loading of 1,500 W. The makers of this kettle also produce standard models in various sizes as well as electric jugs, coffee percolators and vacuo junctions. It has now been decided to fit the Bulpitt " Dorchester " 2 pint aluminium coffee percolator with a swan-neck spout as being more in harmony with the handle. A porcelain model of the Falk Stadelmann " Auto-perc " coffee maker is now available. Construction of the element of the Falk, Stadelmann " Cleanline " kettle makes it suitable for hard water.

Among the newest and most interesting of the wide range of tubular sheathed heating elements for domestic and industrial applications shown by the Backer Electric Co., Ltd., are twin circuit single tube boiling plates (illustrated) meeting E.D.A. specifications. They have two heating coils inside a single tube and even transference of heat. The twin circuit principle is also employed for new washing machine elements the compactness of which renders them specially suitable for the restricted space available in machines incorporating agitators.

As the exhibition has a strong bias toward domestic electrification Geo. Bray & Co., Ltd., have in the limited space available largely tended to emphasize their domestic immersion heaters, kettle elements and ceramic insulators as used for cookers and radio apparatus. Selections are, however, shown of their wide variety of metallic embedded strip, ring and pad elements, and sheathed wire elements bent to various forms. Special high temperature electrical resistance alloys developed by Hall & Pickles, Ltd., include " Kanthal " and " Nicralloy " which operate at up to 1,350 deg C and 1,150 deg C respectively. One of the most important groups of Henry Wiggin & Co.'s alloys is the " Brightray " series of nickel-chromium alloys.

Installed near the Crompton Parkinson stand is a typical fan from the three-size range, controlled by a regulator for demonstrating the 12-point speed regulation. It is one of forty fans installed to cool the exhibition hall and controlled in groups. Silent operation is obtained by rubber washers and buffers fitted between the fan blades and the blade shanks.

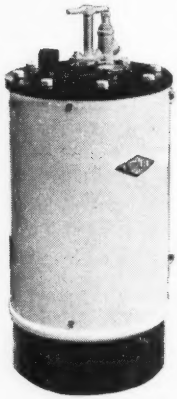
Following their long experience with electro steam cookers Gillott Electro Steam Cookers, Ltd., have developed the " Elecsteam " sterilizing equipment for farms (illustrated) in both



Gillott " Elecsteam " sterilizing equipment

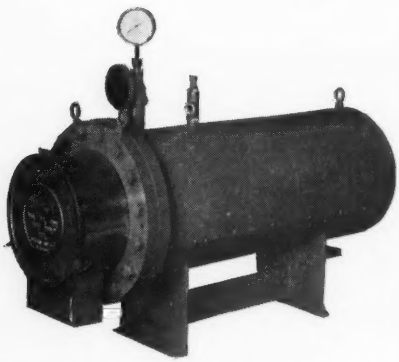
(A) Sterilizing chest. (B) Tray for utensils. (C) Cold water feed tank. (D) Steam generating tank. (E) Immersion elements. (F) Non-return valve. (G) 3-way steam valve. (H) Hot water storage tank. (J) Draw-off tap. (K) Heating element. (L) Lagging.

16 cu ft and 25 cu ft sizes, with hot water and steaming facilities. Only the smaller unit is being shown at Torquay. It has a loading of 1 kW for hot water and 4 kW for steam. The steam capacity is 12 lb per hour and the draw-off hot water capacity at 150 deg F is a minimum of 15 gal. The larger chest has loadings of 1½ kW and 6 kW, a steam capacity of 18 lb per hour and draw-off hot water capacity at 150 deg F of 20 gal minimum. Special arrangements are made for hard water districts. The company is also showing its "Duo-Coil" immersion heaters, drawing particular attention to the "Twin TV Duo-Coil" model.



Left: **G.W.B. "Autolec" 15 kW electrode water heater**

Right: **Hotpoint 411 vacuum cleaner**



Duncan Low central heating circulator unit

Agricultural interests, too, have not been overlooked in the display of domestic and industrial water heating equipment by Duncan Low, Ltd., whose low pressure steam raiser has proved very popular in the smaller farms in Scotland. The company's domestic range includes a new and simplified line of top entry immersion heaters. A circulator unit for central heating (illustrated) is also shown together with a complete range of industrial and flameproof heaters. A new model water heater has just been developed by Aidas Electric, Ltd.

The main emphasis at the Heatrae stand is on storage water heaters and immersion heaters for domestic use, the D.O.T. 1½ and 3 gal automatic water heater forming the centrepiece. The new range of "Creda Redhead" immersion heaters is supplied in lengths from 11¾in to 30in with adjustable replaceable thermostats, while the new Hotpoint type CD unified design "Torribar" water heaters (2 and 3 kW) are available in lengths suitable for direct installation or for bending on site to the dimensions of the storage tank. A new Hotpoint 3 gal thermal storage heater is of the flat D type suitable for wall mounting. B.N.E. water heating appliances include non-pressure, pressure, "Twin" and cistern type heaters, together with immersion heaters and circulators.

The Santon water heating exhibit illustrates the use of "Otter" thermostats to control vertical and horizontal immersion heaters operating in standard household cylinders, temperature recorders indicating their accuracy. Also on display is the new Santon heavy duty rotary switch (200 300 A 230 V d.c. 440 V a.c.). Accompanying an illuminated transparency showing how Bastian & Allen electrode hot water and steam boilers are used to develop off-peak load are a 30 kW steam boiler of new design with simplified controls, a standard 30 kW steam boiler, and a 100 kW hot water boiler.

The smallest water heater of its type ever produced in this country, a 15 kW G.W.B. "Autolec" unit (illustrated), brings the electrode type boilers into an even wider range of applications of particular interest to users requiring small intermittent supplies of heated water for space and process heating. With it are a 450 kW model and also a 70 kW steam raiser.

Apart from the growing tendency to incorporate facilities for heating the water, washing machine design inclines further towards rendering operations more automatic and labour saving. The Universal Boilers and Engineering Co.'s types 503 and 504 "Swirlux" machines are all-electric models with power driven wringers; each has a capacity of 10 lb of dry clothes, and incorporates electrically-operated wringer and pump. In addition, the 504 de luxe model has a timing device for switching the machine off automatically at the end of the desired period. The 500H model, which takes 6 lb of dry clothes and embodies a hand operated wringer, is fitted with a 2 kW

heating unit. All these machines incorporate the new "Swirlux" tangent fin agitator. Two "Versco" washboilers shown have capacities of 10 gal each.

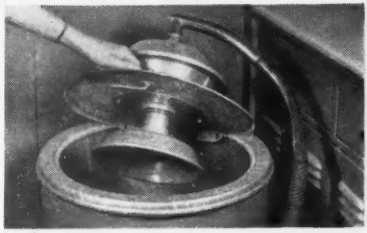
The heated model of the Parnall (Yate) washing machine is capable of raising 7 gal of water from 50 deg F to 160 deg F in about 90 minutes and to boiling point in 130 minutes. As an accessory a vitreous enamel pressing is available to form a table top surface. Attractive features of the new Hoover washing machine are: almost double the washing capacity of the standard machine, a larger wringer easily taking the bulkiest articles, automatic pump emptying and wheels for easy movement. The latest British Vacuum Cleaner & Engineering Co.'s "Goblin" washer has been specially designed to occupy the minimum floor area (17⅞in square) yet still take 4 lb of dry clothes.

Two additions to the English Electric range of domestic appliances introduced this year are the Model 4003 washing machine with 3 kW immersion heater, 12in effective length power wringer and automatic draining system, and the rotary ironer attachment with thermostatic temperature control for use with the company's washing machines. Like all other English Electric domestic appliances they are available in both cream and white enamel finishes.

Apart from the many normal types of washing machines a recent development by L. G. Hawkins & Co., Ltd., the "Posser-matic" (illustrated), enables the housewife who has a vacuum cleaner (with hose attachment) to convert her wash boiler into a fully automatic washing machine. For those who do not aspire to a washing machine the next best thing is a wash boiler, which in any case has its advantages. The usefulness and convenience of this are much enhanced by the fitting of a wringer as is done in the case of the E900 cabinet model made by Burco, Ltd., who are also showing other cabinet and round types as well as their 10P all-electric washing machine (now available with heating elements) and an agricultural water heater. The latest Belling 107A clothes drying cabinet is available in white or cream cellulosed aluminium.

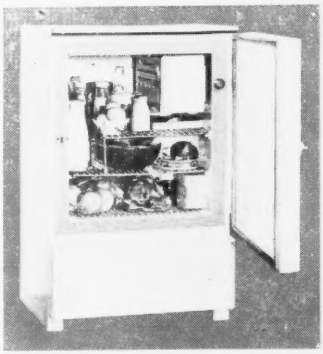
The demand apparently still exists for non-thermostatic irons and the Premier "Smoothwell" model which has been so successful for the past thirty years has been redesigned to bring it into line with modern tendencies. Its thermostatic counterpart, the "Sylph," follows the trend towards lightness and weighs only 3½ lb; it incorporates the almost indestructible "Premicoil" element built into the special light alloy base. The Falk Stadelmann "Featherlight" iron, which weighs only 3 lb, is ready for use in less than one minute. The new Hotpoint "Right-weight" automatic iron has all the features of the "Plus Five" iron, but weighs only 3¾ lb and is suitable for use in either hand.

For those who have ironing tables and wish to avail themselves of the advantages of the Walter "No-cord" iron separate compact units are now available for fitting into the tables. With this "No-cord" equipment are also the new Walter clothes dryer and airer with thermostat and a new industrial ozonizer.



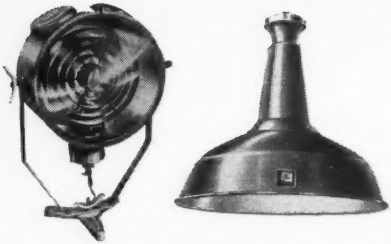
L. G. Hawkins "Posser-matic" clothes washer attachment

G.E.C. 3 cu ft table top refrigerator



A new entrant to the domestic refrigerator market, Wilkins & Mitchell, Ltd., of "Servis" washer fame, show two models, both of the compressor type, with capacities of 3·3 cu ft and 7·6 cu ft. The English Electric Co., Ltd., also has on view a 7·6 cu ft model. The latest model LH.150 Electrolux refrigerator has a porcelain enamel table top and is fitted with a drawer for the storage of cutlery, etc. A Hotpoint H.30 4½ cu ft table top refrigerator is fitted with a "Perspex" door and panels to display the exceptional capacity and shelf spaces.

The new G.E.C. DE71 7 cu ft refrigerator occupies no more floor space than the 5·3 cu ft model and is only 2in higher. The 3 cu ft table top model DE30 (illustrated) matches in dimensions other kitchen units produced to B.S.I. requirements. The British Refrigeration Association's exhibit comprises "Coldrator," "Frigidaire," G.E.C., Kelvinator and "Prestcold" domestic refrigerators from 3 to 9 cu ft,



"Ediswan" floodlight with louvre fitted and (*right*) Benjamin RLM reflector

all incorporating hermetically sealed compressors.

Apart from the Hoover "Standard," "Junior" and "Heavy Duty" vacuum cleaners, a cylinder model is also available. It is equipped with a full range of cleaning tools. The "Dustette" hand-cleaner and a floor polisher which can be converted into a floor scrubber, complete the Hoover display. The new Hotpoint 411 cleaner (illus. p. 1274) incorporates an inner air sleeve dust bag and foot switch. With the specially quiet running Electrolux model 55 cleaner are the model 33 heavy duty machine and the B.6 floor polisher.

The British Vacuum Cleaner & Engineering Co., Ltd., is showing in addition to its domestic machines an extensive range of industrial type portable vacuum cleaners as used in cinemas, industrial buildings, transport vehicles, etc., and also for the removal of hot flue dust from boilers, etc. Industrial and commercial plant made includes both pneumatic and hydraulic extraction equipment for power stations and central installations. Other "Goblin" domestic appliances on view are washing machines, irons and "Teasmade" automatic tea makers.

With regard to the last-mentioned item there has been a considerable revival of interest in the past few months in automatic tea and coffee makers. L. G. Hawkins & Co., Ltd., draw especial attention to their two models, the completely automatic "Tecal," which incorporates an electric clock and lamp, and the "Tiffee," which requires manual switching on.

Manufacture and quality control of "Mazda" lamps is prominently featured on the B.T.H. stand. Among important new features of "Mazda" electric discharge lamps are "Fernico" seals which are invulnerable to attack by sodium vapour, and the thoriated emissive pellet which gives reliable striking without clouding the glass envelope. The new "Monolux" 5ft single lamp fluorescent fitting incorporates a special lampholder permitting one-hand lamping from either end and the "Pendicone" method of rapid installation. "Mazda" universal lighting trunking and a new 75 W reflector spotlight are also displayed.

Simple installation and maintenance, fully adjustable positions of lights and suspensions and rigid construction without sag or warp are features of the new "Crompton Light-Line" system which comprises continuous trunking, control assembly, and fluorescent lighting reflectors. No tools other than screwdriver and pliers are needed for the installation, except for the drilling of two small holes at the ends of each run.

New fluorescent lighting fittings which will be available to the trade in the coming season are to be seen among the Ekco-Ensign Electric display of tungsten filament lamps, projector and special lamps, fluorescent lamps, diffusing glass fittings (for use with tungsten lamps), spotlights and new floodlights. The Ekco ultra-violet lamps for irradiating fluorescent paints, powders, etc., are being demonstrated. Principal Thorn lighting exhibits are a section of the new "Atlas" trunking fitting, a unit demonstrating the comparative colour qualities of "double-life" fluorescent tubes, and an impressive selection of "Atlas" lamps. The Philips Electrical stand is devoted entirely to "Argenta" internally silica coated lamps, a large illuminated model emphasizing the salient features.

New Ediswan products are the "Unilux" single 5ft 80 W fluorescent lamp, batten fitting, incorporating a patent new fixing method, a watertight container box for fluorescent lighting fittings control gear, and a new circular louvre (illustrated) for fixing inside floodlights.

Benjamin lighting fittings as used in power stations throughout the country include the high bay, RLM (illustrated), parabolic angle, "Duoflux," "Flurolier" and "Coolicon" shades, finished in "Crysteel" vitreous enamel. Among the "Coolicon" shades is the new nursery model with gaily decorated figures. The Simplex "Neo-Displex" industrial reflector is now available in an improved form. With examples from the Falk Stadelmann range of contemporary lighting fittings is the "Glen" fluorescent fitting, holding one 4ft 40 W lamp, which can be supplied as a continuous cornice unit, a "Perspex" diffuser screening the lamp from all normal angles of view.

Representing the range of Ferranti transformer products are miniature models of a generator transformer, a power transformer, urban and rural distribution transformers and a moving coil voltage regulator.

A rural distribution transformer (illustrated) built to the new British Electricity Specification T.1, "Transformers from 5 kVA to 1 000 kVA for use in standard 415 V and 240 V systems," is to be seen on the Transformers & Welders stand. In the background a mural painting shows various applications of transformers, with a water power station, a thermal power station, a factory, a farm, a rural village and overhead lines.

A "Davenset" 100 kVA unit (illustrated) designed according to the B.E. Specification T.1, represents Partridge, Wilson & Co.'s latest

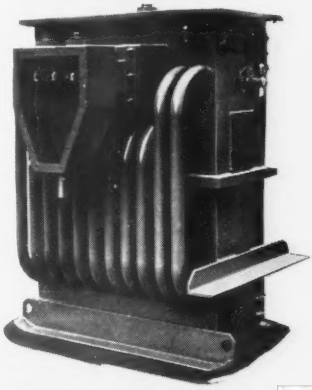
development in the field of power transformers. The Denis Ferranti group shows a standard 300 kVA 11,000/433 V 50 c/s 3-phase delta star connected transformer without tank. Similar construction is employed up to 10,000 kVA (a 1,500 kVA unit is illustrated on this page).

A completely redesigned CO_2 release system by the Walter Kidde Co., Ltd., incorporates a new valve permitting a higher rate of CO_2 discharge and dispensing with the usual cylinder weights and cables. Control of multiple systems is now centralized on a desk panel.

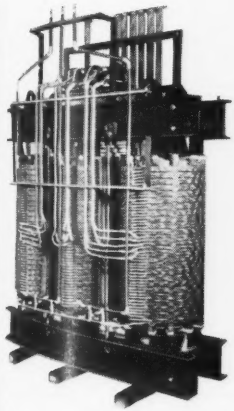
As specialists in equipment for high voltage overhead lines and outdoor substations Line Equipment, Ltd., shows 33 kV and 11 kV rotating and rocking type isolating switches, motor-operated mechanism (illus. p. 1279), as occasionally used for high voltage isolating switches in substations, an 11 kV fuse isolator for liquid fuses, rewirable h.r.c. liquid fuses, expulsion fuse links and transformer excess load indicators. One of the isolating switches is fitted with a new load-break device.

To illustrate its service for the inspection and re-impregnation of wood poles used in carrying overhead power and telegraph lines Cobra (Wood Treatment), Ltd., has arranged a display which also shows how creosoted poles are attacked by fungal decay and insects.

New to this country, the South Wales Switchgear "packet" type outdoor substation (illustrated) incorporates outdoor air insulated vertical isolation oil immersed circuit breaker



Top right: **Transformers & Welders rural distribution transformer.** *Right:* **Partridge Wilson "Davenset" 100 kVA power transformer.** *Above:* **Denis Ferranti 1,500 kVA 11 kV transformer.** *Below right:* **South Wales Switchgear "packet" substation** *(Crown copyright picture)*



units for both 11 kV and 33 kV. Connections between both 11 kV and 33 kV switchgear and power transformers are effected by means of metalclad trunking to give one complete metalclad assembly of the switchgear and the two 7·5 MVA 33 kV/11 kV 3-phase power transformers.

A new Ferguson Pailin 11 kV outdoor fuse switch ring main unit comprises a type "OFS" oil immersed fuse switch which can be fitted with two cable boxes and mounted individually, or, alternatively, can be fitted with ring main oil immersed switches on each side as exhibited. Further details were given in our issue of 22nd May (page 1185).

The original design of the Ferguson Pailin l.v. high breaking cartridge fuse links has been improved (illustrated) and the range has been extended to cover all standard current ratings from 2 to 300 A; it is expected to include up to 800 A in the near future.

Designed for service in outdoor or indoor substations for a maximum voltage of 11 kV and maximum continuous load current of 400 A the Crompton Parkinson "ARA2" fault-making load-breaking ring main unit (illustrated) has been successfully tested on a r.m.s. symmetrical current of 22·4 kA with a peak making current of 64·3 kA.

A non-extensible ring main tee-off equipment (illustrated) has been introduced by J. G. Statter & Co., Ltd., comprising two non-automatic oil switches for controlling the ring main with automatic fuse switch controlling the tee-off; this equipment has been fully tested for use on systems up to 11 kV 250 MVA rupturing capacity. Also displayed are an 11 kV 250 MVA metalclad air insulated oil circuit breaker equipment, a 15 kV outdoor pole mounting isolating switch, instrument switches, house service cut-outs and multi-way insulated phase connector blocks.

The Johnson & Phillips type AG16 air-insulated unit (illustrated) for systems up to 11 kV 250 MVA has been designed for reduced and easy maintenance, maximum economy in space and speedy erection. It is shown fitted with both "Trinal" plain-break and arc-control circuit breakers. Another "Trinal" oil switch is mounted on an economical structure which can be incorporated into any normal J. & P. h.v. switchboard. The type FS/AG fuse-switch unit is suitable for up to 11 kV 250 MVA.

To meet the growing demand for a reliable isolator which is easy to operate under iced-up conditions and has the through short-circuit capacity necessary for modern distribution systems, Switchgear & Equipment, Ltd., have developed the H.O.R.P. and V.O.R.P. units, the former with a horizontal rotating switch blade (illustrated) and the latter with the blade moving in the vertical plane.

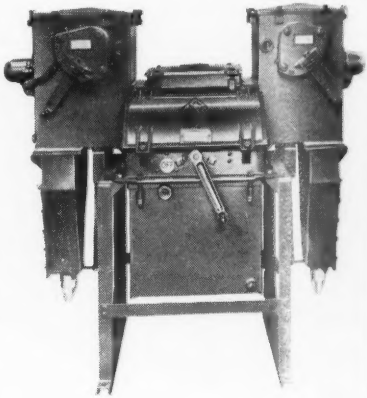
In a Reyrolle 3·3 kV 1,600 A 150 MVA duplicate busbar air-insulated panel with air-break circuit breaker (illustrated) the sheet-steel cubicle has separate compartments to house the two sets of busbars, their isolators, the current transformers and the circuit breaker, "Perspex" windows on one side showing the internal construction. The voltage-transformer isolation is novel giving ready access to the primary fuses. A quarter scale working model of one phase of a 132 kV 2,500 MVA small-oil-volume circuit breaker is cut away to show the internal construction.

Hitherto the Yorkshire Switchgear & Engineering Co.'s switchgear has been provided with rear instrument panels when instruments are called for in excess of those which can be accommodated under the cover of the circuit breaker. In the latest gear, however, the instruments are mounted at the front of the circuit breakers. Working models demonstrate the company's new arc trap.

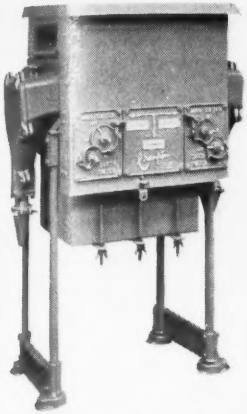
Among new Electrical Apparatus Co.'s exhibits are a new 300 A industrial circuit breaker, A.S.T.A. certified for rupturing capacity, a 3,300 V contactor and a 440 V heavy duty contactor. Push-button starters incorporate a patented thermal overload relay which also gives positive protection against phase failure.

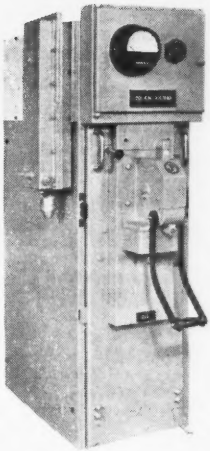
To demonstrate the flexibility of application of the Simplex "Regent" gear a switchgear panel (illustrated) has been made up of standard components. Flameproof equipment is represented by a miniature switchfuse and a 15 A 250 V a.c. switch socket. G. P. Dennis, Ltd., exhibits a l.v. substation distribution switchboard and a heavy industrial fused switch distribution switchboard, with newly designed consumer control units and house service units.

A new range of Falk, Stadelmann industrial switchgear is suitable for the interchanging of

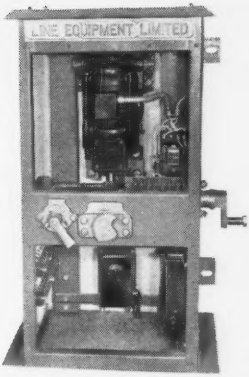


J. G. Statter non-extensible ring main tee-off equipment

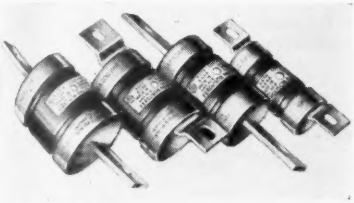




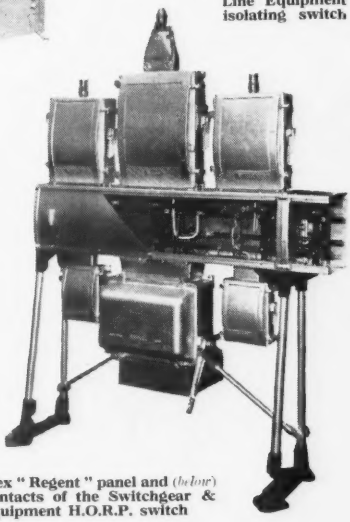
Crompton Parkinson ARA2 ring main unit and *(right)* J. & P. AG16 air insulated switch



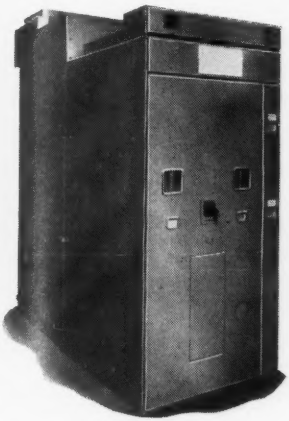
Line Equipment isolating switch



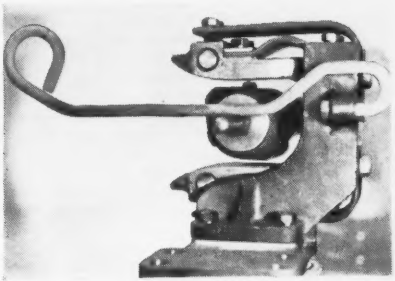
Range of Ferguson Pailin h.b.c. fuse links



Simplex " Regent " panel and *(below)* the contacts of the Switchgear & Equipment H.O.R.P. switch



Reyrolle 3.3 kV 1,600 A 150 MVA duplicate busbar metal enclosed air break circuit breaker



rewirable and h.r.c. fuses. House service units in cast iron and steel include a flush cabinet type which houses the meter and company's cut-out. The "Nearflush" "Realflush" and "Surflush" switches are especially adaptable and easily installed. "Hitest Corrusteel" can be offered to meet any special demands.

Interchangeability of carriers for rewirable and cartridge fuses is a feature which is becoming increasingly apparent among low voltage switch and distribution gear. Apart from the "Invicta," "Royal," "Super K" and "Imperial" h.r.c. types of switchgear the Bill Switchgear equipment (up to 600 A rating) includes the "Vertex" metalclad distribution board (illustrated) for both industrial and domestic use, with interchangeable carriers for semi-enclosed arc damping type fuses or h.r.c. type cartridges. The "Imperial" unit is fitted with a mechanical two-colour on/off indicator incorporated in the switch blade mechanism. Samples of "Crown" 30 A switchgear are exhibited for the first time together with insulated switchfuses, switch splitters and 13A electrical accessories in brown, ivory and cream.

Among Henley distribution equipment are an 11 kV parallel branch joint, a 4-way underground disconnecting box specially designed to enable three cables to enter at one end and one at the other, various types of insulated and ironclad service fuses, a double-pole connector box, consumers' control units, etc. Cable display units show solid type mass impregnated cables for 33 kV and oil-filled and gas cushion cables for voltages up to 132 kV.

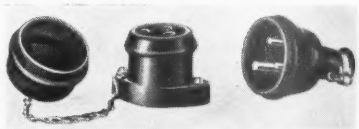
Providing a convenient source of d.c. power supplies from a.c. sources is a range of "SenTerCel" rectifier equipment manufactured by Standard Telephones & Cables, Ltd., who are also showing an automatically controlled power factor correction capacitor installation, power cables, alarm annunciator equipment, control systems for hydro-electric and steam generators, operational telephones for point-to-point contact in power stations, mimic indicator diagrams, electronic impulse frequency telemetering suitable for indicating total generated load in power stations, and control desks.

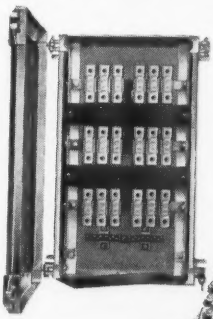
The recently introduced "Nevitron" single anode rectifier tubes are incorporated in a Nevelin 150 kW rectifier cubicle shown. This rectifier is noteworthy for its compactness and efficiency and the ease and low cost of replacing tubes. Examples both with and without control grids are to be seen together with static grid control equipment. A new range of Westinghouse rectifier sets without transformers operates from a 200/250 V single-phase a.c. supply of any frequency to deliver 145/190 V d.c. with current outputs ranging from 0·3 to 60 A. New rectifier/transformer equipment caters for most outputs required for industrial d.c. power supplies. Among Salford industrial rectifier units for power supplies and battery charging is a 1,000 A selenium rectifier stack with samples of selenium and copper oxide rectifiers.

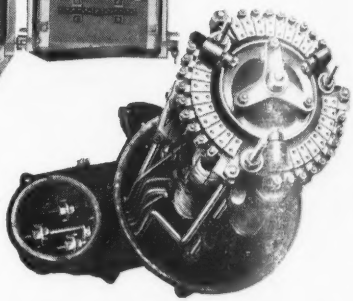
Ellison starting and motor control gear includes a 60 A oil-break star-delta starter, a "Bantam" 20 A oil-break circuit breaker and direct-on starter and a control panel consisting of a 60 A oil-break circuit breaker and an oil-cooled rotor starter (illus.) with the tank cut to show the resistance units. The circuit breakers and star-delta starter are fitted with solenoid overcurrent and undervoltage releases and oil-filled dash-pot time lags. Photographs show up-to-date power station installations of the larger types of Ellison switchgear.

Several sizes of Newman motors to the draft British Standard CN (ELE) 6814 are on view together with "Elf" fractional h.p. totally enclosed industrial and flameproof motors.

Recently the Chilton Electric Products miniature circuit breakers, following tests at an approved A.S.T.A. short circuit testing station, have been granted certificates of performance revealing rupturing capacities which it is believed have never been equalled by similar breakers. On an exhibition panel facilities are available not only to give demonstrations of circuit breakers operating under short circuit conditions, but also for inducing artificial earth faults.







Above: **Nettle 2 A 3 pin rubber weatherproof batten coupler.** *Left:* **Bill "Vertex" t.p. & n. distribution board.** *Below:* **Contact dial and terminals of an Ellison rotor starter**

Special emphasis is being laid this year on safety of installation accessories. It is twenty-six years since M.K. Electric, Ltd., introduced the shuttered socket, a feature now incorporated in a British Standard. This company is also demonstrating the snap-action properties of its "Multy-Kontact" socket, which is so designed that once the initial resistance of the trigger of the shutter mechanism is overcome the plug is forced safely home in one clean movement and cannot be checked in an unsafe position. The M.K. flush units (switches, sockets and switch-sockets) have been redesigned with brass plates with radial edges, avoiding sharp corners and edges. The new "Ediswan Avon" a.c. slot switches of the short-break type have only two moving parts.

From its range of 300 electrical accessories for domestic and commercial wiring Clang, Ltd., has selected for special attention multi-plugs and clock connectors in white Bakelite, ceiling switches and prototype models of the 5A 3 pin ejector plug. The latest Nettle accessory, a 2A 3 pin rubber weatherproof batten coupler (illustrated), is a forerunner of a complete series of batten couplers. It appears in a special illuminated display which includes "Ashton" cables manufactured by the parent company, Aerialite, Ltd. Included in the new Lundberg "Miniac" range of a.c. switches and switch sockets is the actual switch which in a recent destruction test competition completed nearly half a million operations on full load.

Recent installation products of New Day Electrical Accessories, Ltd., include a 1-15 A micro-limit switch with heavy duty mechanism and a wide range of contact pressures, a micro-gap intermediate switch, 3 gang tumbler switches, multi-section tumbler switch units and 1 to 3 gang bell-pushes.

Many of the Tufnol components shown have been made for mechanical service in addition to providing electrical insulation, and these include gear wheels and bearings for electrical equipment, fairleads and instrument panels. Other Tufnol components required for electrical insulation purposes include a collector ring assembly, the insulating core of a h.v. fuse, an insulator for an 11 kV circuit breaker and ball, bell and barrel insulators.

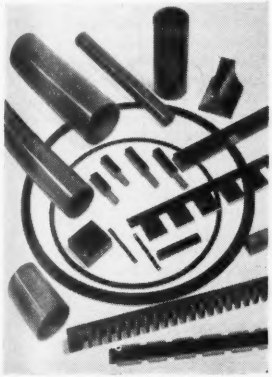
With ebony grade "Sindanyo" electrical insulating boards for panel and switchboard use are natural grade "Sindanyo" arc and heat resisting boards showing the use of the material in air circuit breaker arc chutes, etc. The manufacturers, Turners Asbestos Cement Co., Ltd., also show in their range of "Siluminite" ELS phenolic resin bonded asbestos based laminates exhibits a set of turbo-alternator rotor packing blocks, an air circuit breaker arc chute and an assembled armature illustrating the use of the material as commutator segment spacers. "Melamine" bonded asbestos materials combine high mechanical strength and reasonable electrical properties with extremely high resistance to surface tracking and are non-inflammable.

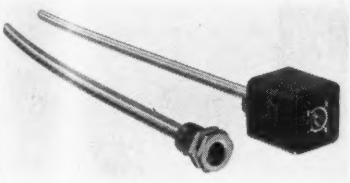
Important electrical uses of plastics indicated by Bakelite, Ltd., include glass-filled silicone for improved heat resistance, materials modified with rubber to give greater impact strength, "Bakelite Laminated" based upon glass fabric providing unusual electrical stability at high temperatures, and polyester resins for "potting" circuits to protect them from heat, moisture and shock.

Several special types of cables have been developed to meet new demands of industry and commerce. The British Insulated Callender's Cables exhibits include h.v. cables of the impregnated pressure and oil-filled types; mass-impregnated non-draining cables, including aluminium-sheathed and lead-covered, wire armoured types; multi-core v.i.t. aluminium-sheathed cables with terminations for control circuits in power stations; transparent p.v.c. covered flexible copper braid for temporary earthing of electrical equipment; industrial and farm wiring systems; power capacitors; rising main box and detachable fused tee box.

Demonstrations are being given by Johnson & Phillips, Ltd., of the ease of jointing of paper-insulated cable with aluminium conductors.

The reliable control of temperature is

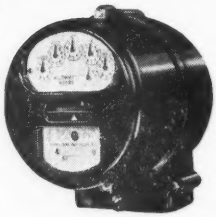




Some of the latest products of Turners Asbestos Cement Co., Ltd., and *(below)* Robert Maclaren water heater thermostat

Siemens "Cathay" post-top fluorescent street lighting lantern

Horstmann flasher unit



Right: Sangamo Weston S.29 single-phase watthour meter

assuming an ever-increasing importance both in industry and the home. All types of thermostats are made by Robert Maclaren & Co., Ltd., suitable for controlling furnaces up to 1,100 deg C and refrigerators down to below freezing; also iron thermostats, float switches and pressure regulators. Special features of a new steam type water heater thermostat are its low cost, reliability, robustness and high current carrying performance. Thermostats for the control of domestic electric water heaters (illus. p. 1281), domestic cooker ovens and space heating are accompanied on the Rheostatic Co.'s stand by automatic temperature control devices for central heating installations. Multi-heat switches for cooker hotplate control include 3, 4, 5, 6 and 7 heat models. With new single, double and multi-circuit a.c. cooker switches for standard side or rear wiring on the "Diamond H" Switches stand are new oven thermostats, a special thermostat with an independent broil switch and plug-in neon pilot, rotary reciprocating packet switches (10/30 A) and 3 A single pole "on/off" and momentary contact one-hole-fixing toggle switches. The Klixon motor protection thermostat operating under stalling conditions accompanies a G.E.C. oven thermostat and simmerswitch.

In addition to time switches for the automatic control of street lighting the Horstmann Gear Co., Ltd., has developed, for use at illuminated zebra crossings, a flasher unit (illustrated) incorporating a synchronous motor driven movement based on the type "V" time switch. The unit is fully suppressed against radio and television interference and can be inspected without disturbing any wiring.

Details of the various adjustments and the components which go to make up a single-phase maximum current rating meter are shown in an "exploded" model by Smith Meters, Ltd., who are also prominently displaying prepayment meters and new polyphase meters with and without maximum demand indicators. A selection of Denis Ferranti single-phase meters includes the TM2 long range type and the new type TM3 M.C.R. pattern which is designed to comply with B.S.37 Parts I and II as a maximum current rating meter. It employs an anisotropic magnet braking system claimed to be the most efficient in use to-day. The type TP2 a.c. prepayment meter with mechanism enables rate per unit and coin in slot to be changed without fitting new parts. Denis Ferranti exhibits also cover type KT3 and KT4 double and triple elements polyphase 3-wire and 4-wire house service meters and synchronous electric clocks. Sangamo Weston, Ltd., shows the new S.29 Form 1 single-phase watthour credit meter (illustrated) together with synchronous time switches, synchronous motors, and motor units and instruments.

The Electrical Apparatus Co.'s new M.C.R. meter to B.S.37 (1952) illustrated on page 1283 has an exceptional low VA consumption thereby permitting testing in large batches. A frequency meter is unaffected by a wide variation of circuit voltage and a moving coil relay operates as a combined earth leakage indicator and trip.

New Crompton Parkinson long circular scale switchboard type instruments (6in and 3½in dials) include wattmeters, moving coil and moving iron ammeters, a moving iron voltmeter and a frequency meter. They are enclosed in pressed steel or moulded cases of recent design.

A Salford a.c. load analyser consists of an ammeter, voltmeter, wattmeter and power factor meter all mounted in one portable case. A demonstration is given of the new S.E.I. transducer for measuring mechanical quantities on an electrical indicator remotely positioned from the measuring head.

Among exhibits of special scientific interest is an electronic digital computer manufactured by Ferranti, Ltd., under patent licence from the National Research Development Corporation. It is represented in the form of a scale model of the equipment the original of which is built in two bays with a separate control desk. Originally designed for use with these high speed electronic digital computers, the Ferranti high speed tape reader has many applications in the field of communications, reading standard 5 or 7 hole teleprinter tape at the rate of 200 characters per second. The tape is driven by friction and can be passed through the photo-electric reader thousands of times without damage.

Increased attention is being paid to industrial finishes both protective and decorative. Jenson & Nicholson, Ltd., are showing practical examples of the application of "Sovcontless"

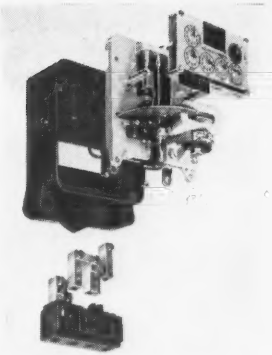
impregnating varnishes and other of their insulating varnishes and machinery finishes. Donald MacPherson & Co., Ltd., are for the first time showing a white insulating paint for the interior of switch boxes, for the purpose of providing insulation against arcing between the "break-points" of the box. Among the company's hot spray lacquers, the "Foochow" hot spray stoving filler enables an excellent finish to be obtained on rough castings without any rubbing down process.

Three manufacturers are participating in a special display of electric vehicles. An interesting feature of the Tomlinson "Roadster 75" milk float shown is that the chassis is also the basis of one of the company's ranges of works trucks. The same chassis has been supplied with suitable bodywork for jointers' repair work, refuse collection, etc. The company's most popular model, the "Universal Major" works truck 15/20 cwt (illustrated) also shown, possesses the maximum manœuvrability possible in a powered truck.

Apart from a standard 10 cwt Morrison-Electricars van, Austin Crompton Parkinson Electric Vehicles, Ltd., show a P.90 flat deck vehicle (illustrated), a 1 ton model which is proving especially popular with appropriate bodywork for dairy delivery. The flat deck vehicle is also capable of many useful municipal applications. Its special features include the generous provision of safeguards to prevent the starting of the vehicle by unauthorized persons and its 4 wheel wide track construction which gives virtually complete stability.

The Electrical Association for Women's stand draws attention to the occasions on which the Association has been honoured by the interest of the members of the Royal Family, from the Conference for Women in Science, Industry and Commerce in 1925, to the visit of Her Late Majesty Queen Mary to the headquarters at 35, Grosvenor Place. The Electrical Industries Benevolent Association indicates the various means by which its work is carried on through its headquarters and forty-four branches.

The "Electric Cookery Book" distributed by the Electrical Development Association to the Electricity Boards is being shown by the Landwood Distributing Co., Ltd.



Electrical Apparatus Co.'s M.C.R. meter

At the Holy Trinity Church Memorial Hall, a joint exhibit by the Siemens Organization, the Benjamin Electric, Ltd., and Holophane, Ltd., includes demonstrations of glass blowing and other manufacturing processes, a working model of a cable armouring machine and examples of scientific glassware. A Siemens automatic private branch telephone exchange is also in operation. Another feature, "Electric Light—The Siemens Story," illustrates the achievements and developments by Siemens from 1870 to the present day. Prominent also are two new "Sieray" fluorescent street lighting lanterns (illustrated). On the platform is a working model of a typical ship's wheel house, while in the hall are the engine room telegraph together with working torsion meter.

In addition to its stand in the exhibition the Simplex Electric Co., Ltd., has displays in the windows of the South Western Electricity Board's Service Centres, Union Street, Torquay, and Torquay Road, Paignton, T. L. Harding & Sons, Ltd., Market Street, Torquay and C. Buswell & Sons, Ltd., Union Street, Torquay.

Right: **Tomlinson universal works truck.** *Below:* **Morrison-Electricars P.90 flat deck battery vehicle**

LIST OF EXHIBITORS AT TORQUAY

	Stand No.
AIDAS ELECTRIC, LTD., Rowdell Road, Northolt	71
AUSTIN CROMPTON PARKINSON ELECTRIC VEHICLES, LTD., 95/99, Ladbroke Grove, London, W.11	*
BACKER ELECTRIC CO., LTD., Fitzwilliam Road, Rotherham	85
BAKELITE, LTD., 12–18, Grosvenor Gardens, S.W.1	55
BASTIAN & ALLEN, LTD., Ferndale Terrace, Harrow	72
BELLING & CO., LTD., Bridge Works, Southbury Road, Enfield	41
BENJAMIN ELECTRIC, LTD., Brantwood Road, N.17	39
BERRY'S ELECTRIC, LTD., Newman Street, W.1	46
BEST PRODUCTS, LTD., Felix Works, Felixstowe	15
BILL SWITCHGEAR, LTD., Aston Lane, Birmingham, 20	33
BRATT COLBRAN, LTD., 10, Mortimer Street, W.1	54
GEO. BRAY & CO., LTD., Leicester Place, Blackman Lane, Leeds, 2	17
BRITISH ELECTRICAL & ALLIED MANUFACTURERS' ASSOCIATION, 36–38, Kingsway, W.C.2	88
BRITISH ELECTRICITY AUTHORITY, British Electricity House, Winsley Street, W.1	90
BRITISH INSULATED CALLENDER'S CABLES, LTD., Prescot	30
BRITISH NATIONAL ELECTRICS, LTD., Charlton, S.E.7	21
BRITISH REFRIGERATION ASSOCIATION, 1, Lincoln's Inn Fields, W.C.2	89
BRITISH THOMSON-HOUSTON CO., LTD., Rugby	77
BRITISH VACUUM CLEANER & ENGINEERING CO., LTD., Leatherhead	44
BULPITT & SONS, LTD., Swansea Works, Birmingham,1	75
BURCO, LTD., Rose Grove, Burnley	13
CABLE MAKERS' ASSOCIATION, High Holborn House, High Holborn, W.C.1	69
CHILTON ELECTRIC PRODUCTS, LTD., Hungerford, Berks	56
CLANG, LTD., Crown Yard, Cricklewood, N.W.2	99
COBRA (WOOD TREATMENT), LTD., 37, Manchester Street, W.1	57
E. K. COLE, LTD., 45, Essex Street, W.C.2	14A
CROMPTON PARKINSON, LTD., Crompton House, Aldwych, W.C.2	8
DENIS FERRANTI CO., LTD., Royton, Oldham	45
G. P. DENNIS, LTD., Fleming Road, Speke, Liverpool	74
"DIAMOND H" SWITCHES, LTD., Gunnersbury Avenue, W.4	78
DIMPLEX, LTD., Totton, Hants	96
DUNCAN LOW, LTD., 299, Bell Street, Glasgow, C.4	23
EDISON SWAN ELECTRIC CO., LTD., 155, Charing Cross Road, W.C.2	76
EKCO-ENSIGN ELECTRIC, LTD., 45, Essex Street, Strand, W.C.2	19
ELECTRIC LAMP MANUFACTURERS' ASSOCIATION, LIGHTING SERVICE BUREAU, 2, Savoy Hill, W.C.2	70
ELECTRICAL APPARATUS CO., LTD., St. Albans, Herts.	62
ELECTRICAL ASSOCIATION FOR WOMEN, 35, Grosvenor Place, S.W.1	98
ELECTRICAL INDUSTRIES BENEVOLENT ASSOCIATION, 32, Old Burlington Street, W.1	50
ELECTRICAL REVIEW, Dorset House, Stamford Street, S.E.1	95
ELECTROLUX, LTD., 153–5, Regent Street, W.1	58
GEORGE ELLISON, LTD., Perry Barr, Birmingham, 22B	53
ENGLISH ELECTRIC CO., LTD., 28, Kingsway, W.C.2	61
FALCO ELECTRICAL APPLIANCES, LTD., Corporation Road, Audenshaw	82
FALK, STADELMANN & CO., LTD., 91, Farringdon Road, E.C.1	28
FERGUSON PAILIN, LTD., Manchester, 11	1
FERRANTI, LTD., Hollinwood, Lancs	51
GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2	60
GILLOTT ELECTRO-STEAM COOKERS, LTD., Cotswold Works, Chalford, Glos	38
G.W.B. ELECTRIC FURNACES, LTD., Dibdale Works, Dudley	18
HAGUE & MCKENZIE, LTD., Pyramid Works, Sloane Street, Birmingham, 1	3
HALL & PICKLES, LTD., Manchester, 1	67
L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, W.C.2	93
HEATRAE, LTD., Norwich	92
W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., 95, Aldwych, London, W.C.2	10
H. M. V. HOUSEHOLD APPLIANCES, Hayes, Middlesex	48
HOOVER, LTD., Perivale, Middlesex	52
HORSTMANN GEAR CO., LTD., Newbridge Works, Bath	79
HOTPOINT ELECTRIC APPLIANCE CO., LTD., Fletton, Peterborough	68
HURSEAL, LTD., 229, Regent Street, W.1	24
JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, S.W.1	87
JENSON & NICHOLSON, LTD., 36, St. James's Street, S.W.1	53
JOHNSON & PHILLIPS, LTD., Charlton	1
WALTER KIDDE CO., LTD., Belvue Road, Northolt	25
LANDWOOD DISTRIBUTING CO., LTD., 18, Cowcross Street, E.C.1	86
LINE EQUIPMENT, LTD., 32, Queen Victoria Street, E.C.4	26
ROBERT MACLAREN & CO., LTD., Eglinton Works, Kilbirnie Street, Glasgow, C.5	36
DONALD MACPHERSON & CO., LTD., 21, Albion Street, Manchester, 1	60
MIDLAND VEHICLES, LTD., Upper Grove Street, Leamington Spa	*
M.K. ELECTRIC, LTD., Wakefield Street, Edmonton	47
MOND NICKEL CO., LTD., Thames House, Millbank, S.W.1	42
NETTLE ACCESSORIES, LTD., Harper Road, Wythenshawe, Manchester	94
NEVELIN ELECTRIC CO., LTD., Purley Way, Croydon	7
NEW DAY ELECTRICAL ACCESSORIES, LTD., 136-8, Mary Street, Balsall Heath, Birmingham, 12	37
NEWMAN INDUSTRIES, LTD., Yate, Bristol	81
PARNALL (YATE), LTD., Yate, Bristol	4
PARTRIDGE, WILSON & CO., LTD., Evington Valley Road, Leicester	*
PHILIPS ELECTRICAL, LTD., Century House, Shaftesbury Avenue, W.C.2	65
PREMIER ELECTRIC HEATERS, LTD., Keeley Street and St. Andrews Road, Birmingham, 9	63
REVO ELECTRIC CO., LTD., Tipton, Staffs	31
A. REYROLLE & CO., LTD., Hebburn, Co. Durham	29
RHEOSTATIC CO., LTD., Slough	22
SALFORD ELECTRICAL INSTRUMENTS, LTD., Peel Works, Silk Street, Salford, 3, Lancs	64
SANGAMO WESTON, LTD., Enfield	29
SANTON, LTD., Somerton Works, Newport, Mon.	83
SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., 38–39, Upper Thames Street, E.C.4	20
SIMPLEX ELECTRIC CO., LTD., Broadwell, Oldbury	49
SMITH METERS, LTD., Rowan Road, S.W.15	59
SOUTH WALES SWITCHGEAR, LTD., Blackwood, Mon.	14
SOUTH WESTERN ELECTRICITY BOARD, Electricity House, Bristol, 1	91
STANDARD TELEPHONES & CABLES, LTD., 10, Essex Street, Strand, W.C.2	12
J. G. STATTER & CO., LTD., 82, Victoria Street, S.W.1	6
SUNVIC CONTROLS, LTD., 10, Essex Street, W.C.2	97
SWITCHGEAR & EQUIPMENT, LTD., Southam Road, Banbury	5
THORN ELECTRICAL INDUSTRIES, LTD., 105–109, Judd Street, W.C.1	43
TOMLINSON (ELECTRIC VEHICLES), LTD., Cheltenham Road, Witney, Oxon	*
TRANSFORMERS & WELDERS, LTD., Sandown Road, Watford	2
TRICITY COOKERS, LTD., 109, Kingsway, W.C.2	27
TUFNOL, LTD., Perry Barr, Birmingham, 22B	33
TURNERS ASBESTOS CEMENT CO., LTD., Trafford Park	16
UNIVERSAL BOILERS & ENGINEERING CO., LTD., Fulledge Works, Burnley	40
VACTRIC, LTD., 149, Regent Street, W.1	80
J. & H. WALTER, LTD., 19, Charing Cross Road, W.C.2	85
WESTINGHOUSE BRAKE & SIGNAL CO., LTD., 82, York Way, Kings Cross, N.1	9
HENRY WIGGIN & CO., LTD., Wiggin St., Birmingham, 16	42
WILKINS & MITCHELL, LTD., Darlaston	84
YORKSHIRE SWITCHGEAR & ENGINEERING CO., LTD., 133/135, Grand Buildings, Trafalgar Square, W.C.2	32

* Included in Electric Vehicle Exhibit.

GENERATION in GREAT BRITAIN

To-day's Situation

THE approach of the 1953 British Electrical Power Convention; recovery from the war-time and post-war power station plant shortages, as reflected in the far fewer load sheddings now; five years' experience of nationalized electricity supply; and nearly as long a period since the assessment of the generation position in the national supply survey of the *Electrical Review* in 1949 and 1950: all these items seem to point to the present time as an appropriate one for again presenting an up-to-date picture of genera tion in Great Britain.

With the co-operation of the British Electricity Authority and the North of Scotland Hydro-Electric Board we have endeavoured to show, first, by the accompanying map, the position at a glance and, secondly, by means of the quick-reference schedule, also in this article, the position with regard mainly to the plant and its operation. The map and the schedule are linked by suitable reference numbers relating to the power stations.

The type of information compiled in both the map and the schedule was selected after the most careful consideration and consultation with many leading supply engineers.

In designing the map it was felt that a general characteristic background to the information was most desirable. This could have been done in terms of almost any of the special Ordnance Survey maps showing population density, land utilization, industry and agriculture, and so on, but we saw no reason why all of these could not be expressed electrically on this essentially electrical map. So with the co-operation of the fourteen Electricity Boards and the North of Scotland H.E.B. we have done this in terms of load density in kW/sq mile on a Sub-Area basis in the case of the fourteen Area Boards and on an Area basis for the North of Scotland.

There is, of course, no such thing as a uniform distribution of load throughout any territory, be it a Board Area, a Sub-Area or a township. But this does not mean that the load density scheme has no value—indeed the scheme is in wide use throughout the whole of the supply industry; but lest any reader should be tempted to tie up in his mind any of the Areas or Sub-Areas of which the load densities are indicated with any individual power stations or groups of stations we would emphasize again that the scheme is one of general characterization in electrical terms and not one of electrical definition.

The possible selections of gradings in such a load density scheme are, of course, limitless, and we have made the scheme as simple as possible with only four gradings, so that broadly we have the densely populated and industrial areas of London, the Midlands and the North in the group at one end of the range, the sparsely populated territories of nearly all Scotland, the Lake District, the Yorkshire Moors, South-West England and East Anglia at the other end, and two intermediate groups representing areas rich in industry and agriculture, respectively.

Summary of the Position

It will be seen from the schedule that there are, all told, 331 public supply power stations at present in operation in Great Britain, 284 of them being owned by the B.E.A. and 47 by the North of Scotland Board. The stations range from the very large ones, approaching 600 MW in installed generator capacity, such as Barking (597·25 MW) and Hams Hall (570·54 MW), to such small ones as the Lairg internal-combustion-engine station (224 kW) and the Kensham hydro station (32 kW). The total installed generating plant capacity of all the B.E.A. stations in operation is about 16·5 million kW, while the total output capacity of all the stations last year was about 15·5 million kW.

The output of all stations during 1952

was 58,228 million kWh, including 57,177 million kWh from the B.E.A. stations. The average load on all the B.E.A. stations in the same year was 44·58 per cent of the maximum load.

About 304 million kWh was "imported" by the B.E.A. from the North of Scotland Board, while about 243 million kWh was imported directly by the B.E.A. from other major public supply sources, from the Port Sunlight undertaking, for instance. There is, of course, a fair amount of parallel running between the public supply and private industrial generation, but this is arranged, in the main, directly by the Electricity Boards. It has proved impossible to get anything like a reliable estimate of the extent of this parallel running and we will not speculate on the matter.

There is no reason, however, why we should not pass on a few extracts from information given us by some of the Electricity Boards, so long as they are not used in any way whatever for assessment purposes. The North Eastern Electricity Board purchased during 1952–53 39 million kWh generated by consumers' private plants, while the North Eastern Division during the same period purchased nearly 49 million kWh generated by consumers' waste-heat plants, representing a total of about 88 million kWh.

During the same year the South Wales Board imported about 34 million kWh from its "parallel running" consumers. The South West Scotland Board runs in parallel with about 39,000 kW of privately owned generating plant. We have been even less fortunate in an effort to obtain some idea of the extent to which normal private electricity generation prevails throughout the country.

The steam stations represent by far the greater part of the total B.E.A. generating plant capacity, and the total amount of fuel consumed in them last year was 35,137,971 tons. Of this amount 33·96 per cent was consumed in the form of pulverized coal.

The overall thermal efficiency of all the B.E.A. steam stations was 22·62 per cent. In many cases in the schedule different thermal efficiency figures were given us for different sections of an individual station, and in each of these cases we have recorded the highest figure. The highest thermal efficiency of all the stations or station sections is 49 per cent for Battersea "H," but this section is associated with the Pimlico district heating scheme, so it can hardly be regarded as a normal case. Other stations with outstandingly high thermal efficiencies include Littlebrook "B," 29·95 per cent; Dunston "B," 29·65 per cent; Bromborough, 28·88 per cent; Stourport "B," 28·84 per cent; Battersea "B," 28·71 per cent; Brunswick Wharf, 28·23 per cent; and Poole 28·11 per cent. Of these stations Brunswick Wharf, Littlebrook "B," Poole, Stourport "B" and Bromborough are all post-war.

Stations with particularly high steam conditions include Portobello H.P., 1,350 lb/sq in and 950 deg F; Battersea "B," 1,350 lb/sq in and 950 deg F; Taylor's Lane H.P., 1,300 lb/sq in and 950 deg F; Littlebrook "A," 1,235 lb/sq in and 825 deg F; Brimsdown "A" and "B," 1,900 lb/sq in and 930 deg F; and Stourport "B," 1,250 lb/sq in and 950 deg F. Among the stations with the highest outputs are: Barking, 2,252 million kWh; Hams Hall (Birmingham), 2,198 million kWh; and Fulham, 2,044 million kWh.

Battersea appears to be the only station with turbo-alternators as large as 100 MW—one 100 MW and one 105 MW. Battersea also has the next largest set, i.e., one of 84 MW, while the next in the list appear to be the five 75 MW sets at Barking.

There are at present under construction, but not yet in operation, 23 B.E.A. stations, all steam, representing a total of 4,358 MW of generating plant. Of these the largest is Castle Donington with a planned capacity of 400 MW. The North of Scotland H.E.B. has 14 water-power stations under construction or planned, with a total capacity of 286 MW. The largest of these is Errochty which will have a capacity of 75 MW.

Special Cases

The atomic power station in Cumberland, which has been announced as likely to be in commission in a couple of years, is not included in either our map or schedule because, as an experimental development, it is not really a part of to-day's picture.

Much the same may be said of the gas-turbo alternators at the Trafford Park and Dundee power stations, although in these cases the stations are indicated and the gas-turbo sets are included in the appropriate capacity totals.

SCHEDULE OF POWER STATIONS SUPPORTING THE REFERENCE MAP BY DETAILED INFORMATION

SCHEDULE OF POWER STATIONS SUPPORTING THE REFERENCE MAP BY DETAILED INFORMATION

Map Ref.	Name of Station	Type of Prime Movers	Type of Cooling	Method of Fuel Delivery	Total Gen. Plant in Commission—MW	Extns. Planned or under Constructn.—Generating Sets	Steam Generating Sets 30 MW & above Hydro above 10 MW	Total Boiler Capacity k lb hr	Boilers above 100 k lb hr	Steam Conditions at Turbines lb/sq in deg F		Type of Firing	Year oldest set Commissioned	Generating Voltage kV	Cap. Associated Grid Trans. MVA	kWh Supplied in 1952—Millions	Thermal Efficiency, 1952	Hours Running, 1952	Fuel Consumed Thousand tons Coal only
	NORTH OF SCOTLAND																		
1	Sloy	H	—	—	130·0	—	4×32·5	17	910	—	—	—	1950	11·0	140	107·9	—	2,119	—
2	Pitlochry	H	—	—	15·0	—	—	22	50	—	—	—	1950	11·0	120	49·0	—	8,756	—
3	Clunie	H	—	—	61·2	—	3×20·4	27·5	173	—	—	—	1950	11·0	—	123·5	—	4,678	—
4	Tummel Bridge	H	—	—	31·0	—	2×17	22·5	173	—	—	—	1933	11·0	42	106·9	—	5,835	—
5	Rannoch	H	—	—	48·0	—	3×16	46	512	—	—	—	1930	11·0	60	167·0	—	6,250	—
6	Fasnakyle	H	—	—	66·0	—	—	31·5	522	—	—	—	1951	11·0	70	229·1	—	8,315	—
7	Grudie Bridge	H	—	—	24·0	—	—	83	537	—	—	—	1950	11·0	40	75·7	—	4,600	—
8	Gairloch	H	—	—	0·75	—	—	17	185	—	—	—	1952	0·415	—	1·2	—	8,252	—
9	Lochalsh	H	—	—	1·25	—	—	5	490	—	—	—	1948	0·415	—	3·6	—	8,784	—
10	Storr Lochs	H	—	—	1·6	—	—	24	447	—	—	—	1952	3·3	—	1·0	—	4,400	—
11	Morar	H	—	—	0·75	—	—	49	16	—	—	—	1948	0·415	—	1·7	—	8,784	—
12	Bught (Inverness)	H	—	—	0·1	—	—	—	12	—	—	—	1929	0·415	—	0·2	—	8,694	—
13	Inshes (Inverness)	H	—	—	0·040	—	—	—	340	—	—	—	1920	—	—	0·1	—	8,564	—
14	Cowal	H	—	—	6·0	—	—	14·3	403	—	—	—	1949	3·3	—	10·6	—	4,561	—
15	Lussa	H	—	—	2·4	—	—	20	380	—	—	—	1952	11·0	—	5·7	—	4,762	—
16	Brodick	H	—	—	0·135	—	—	—	760	—	—	—	1951	0·415	—	0·4	—	6,522	—
17	Aberdeen	S	R	R	57·25	—	—	57,250	12	265	700	S	1913	6·6	60	113·2	19·09	4,896	88,480
18	Dundee	S	R	R	63·625	1×12·5	—	63,625	9	350 180	750 600	S	1914	11·0 6·6 3·3	60	182·1	21·5	6,751	121,000
19	Arbroath	S	—	—	7·25	—	—	—	—	—	—	—	—	—	—	0·3	—	—	—

EXPLANATORY NOTES RELATING TO SCHEDULE

In the column giving the types of the prime movers the following code is used: S = steam; H = hydro; I = internal combustion; IH = combined internal combustion and hydro.

In the column giving the types of cooling the code is: T = tower; R = river; C = canal; W = well; S = sea; P = spray ponds.

In the column depicting the method of fuel delivery the code is: R = rail; Rd = road; S = ship; B = barge.

The code for the types of firing is: CG = chain grate; HF = hand firing; OF = oil firing; RS = retort stoker; SS = spreader stokers; PF = pulverized fuel.

For hydro stations we have in the column headed "Total boiler capacity" shown the storage capacity in millions of cu ft for the B.E.A. stations, where known; and storage capacity in percentage of annual output in the case of the North of Scotland H.E.B. stations, where known.

In the column headed "Boilers above 100 k lb/hr" we have for hydro stations shown the water head in feet, where known.

Stations Nos. 19, 20 and 21 are used only occasionally for peak loads.

Map Ref.	Name of Station	Type of Prime Movers	Type of Cooling	Method of Fuel Delivery	Total Gen. Plant in Commission—MW	Extns. Planned or under Construction. Generating Sets	Steam Generating Sets 30 MW & above Hydro above 10 MW	Total Boiler Capacity—k lb hr	Boilers above 100 k lb hr	Steam Conditions at Turbines lb/sq in deg F	Type of Firing	Year oldest set Commissioned	Generating Voltage kV	Cap. Associated Grid Trans. MVA	kWh Supplied in 1952—Millions	Thermal Efficiency, 1952	Hours Running. 1952	Fuel Consumed Thousand tons Coal only
										NORTH OF SCOTLAND *(continued)*								
20	Perth	S	—	—	2·0	—	—	—	—	—	—	—	—	—	0·1	—	—	—
21	Wick	S	—	—	0·5	—	—	—	—	—	—	—	—	—	0·3	—	—	—
22	Ardrishaig	I	—	Rd.	1·94	—	—	—	—	—	—	1937	0·415	—	0·002	—	5,139	—
23	Bowmore	I	—	S.Rd.	0·97	—	—	—	—	—	—	1948	0·415	—	0·002	—	8,784	—
24	Brodick	I	—	B	2·07	—	—	—	—	—	—	1946	0·415	—	0·003	—	8,404	—
25	Campbeltown	I	—	B	3·14	—	—	—	—	—	—	1944	11·0 3·3	—	0·006	—	6,896	—
26	Kirkwall (Old)	I	—	Rd.	0·65	—	—	—	—	—	—	1937	11·0 0·415 0·440 DC	—	—	—	1,008	—
27	Kirkwall (New)	I	—	S	4·04	—	—	—	—	—	—	1950	4·1 0·415	—	0·008	—	8,788	—
28	Lerwick (Old)	I	—	Rd.	0·810	—	—	—	—	—	—	1937	11·0 0·415	—	0·004	—	6,300	—
29	Lerwick (New)	I	—	S	3·00	—	—	—	—	—	—	1952	11·0 11·0	—	0·002	—	3,215	—
30	Lochboisdale	I	—	S	0·39	—	—	—	—	—	—	1945	0·415	—	0·001	—	8,784	—
31	Stornoway (Airfield)	I	—	Rd.	0·72	—	—	—	—	—	—	1947	0·415	—	—	—	1,346	—
32	Stornoway (Battery Point)	I	—	S	2·6	—	—	—	—	—	—	1951	11·0	—	0·004	—	8,046	—
33	Stornoway (Ropework Road)	I	—	Rd.	0·755	—	—	—	—	—	—	1932	0·480 DC 0·415 3·3 11·0	—	0·002	—	4,768	—
34	Tobermory	I	—	Rd.	0·925	—	—	—	—	—	—	1949	0·415	—	—	—	8,784	—
35	Ullapool	I	—	Rd.	0·910	—	—	—	—	—	—	1948	0·415	—	—	—	8,784	—
36	Wick (Old)	I	—	Rd.	1·380	—	—	—	—	—	—	1928	0·415 3·5 0·460 DC	—	0·001	—	5,856	—
37	Wick (New)	I	—	Rd.	3·600	—	—	—	—	—	—	1951	11·0	—	0·005	—	6,832	—
38	Aultbea	I	—	Rd.	0·525	—	—	—	—	—	—	1950	0·415	—	—	—	534	—
39	Brora	I	—	Rd.	0·470	—	—	—	—	—	—	1939	0·415	—	—	—	76	—
40	Dunoon	I	—	B	3·300	—	—	—	—	—	—	1929	0·415 6·6	—	0·002	—	2,732	—
41	Fort William	I	—	Rd.	0·40	—	—	—	—	—	—	1918	0·415	—	—	—	24	—
42	Lairg	I	—	Rd.	0·224	—	—	—	—	—	—	1930	0·415	—	—	—	14	—
43	Lochalsh	I	—	Rd.	0·660	—	—	—	—	—	—	1946	0·415	—	—	—	272	—
44	Mallaig	I	—	R	0·350	—	—	—	—	—	—	1946	0·415	—	—	—	2	—
45	Oban	I	—	Rd.	1·170	—	—	—	—	—	—	1908	5·5 0·500 DC 0·250 DC	—	—	—	52	—
46	Rothesay	I	—	B	2·750	—	—	—	—	—	—	1932	6·6 11·0 0·480 DC	—	—	—	2,214	—
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

[illegible]	[illegible]	I	—	Rd	0·749	—	—	—	—	—	—	1935	0·415	—	0·001	—	7,056	—
48	Errochty	H	—	—	—	75	—	—	610	—	—	—	—	—	—	—	—	—
49	Mullardoch Tunnel	H	—	—	—	2·4	—	—	160	—	—	—	—	—	—	—	—	—
50	Sron Mhor	H	—	—	—	5·0	—	—	965	—	—	—	—	—	—	—	—	—

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
47	Errochty	I	—	Rd.	0·740	—	—	—	—	—	—	—	1935	0·415	—	0·001	—	7,056	—
48	Errochty	H	—	—	—	55	—	—	610	—	—	—	—	—	—	—	—	—	—
49	Mullardoch Tunnel	H	—	—	—	2·1	—	—	—	—	—	—	—	—	—	—	—	—	—
50	Sron Mhor	H	—	—	—	5·0	—	—	160	—	—	—	—	—	—	—	—	—	—
51	Clachan	H	—	—	—	40·0	—	—	965	—	—	—	—	—	—	—	—	—	—
52	Gaur	H	—	—	—	6·0	—	—	92	—	—	—	—	—	—	—	—	—	—
53	Glascarnoch	H	—	—	—	24·0	—	—	529	—	—	—	—	—	—	—	—	—	—
54	Luichart	H	—	—	—	24·0	—	—	185	**Stations under construction or planned**									
55	Torr Achility	H	—	—	—	15·0	—	—	52										
56	Achanalt	H	—	—	—	2·0	—	—	65	—	—	—	—	—	—	—	—	—	—
57	Finlarig	H	—	—	—	30·0	—	—	1,362	—	—	—	—	—	—	—	—	—	—
58	Quoich	H	—	—	—	22·0	—	—	320	—	—	—	—	—	—	—	—	—	—
59	Invergarry	H	—	—	—	20·0	—	—	175	—	—	—	—	—	—	—	—	—	—
60	Ceannacroc	H	—	—	—	20·0	—	—	296	—	—	—	—	—	—	—	—	—	—
61	Loch Dubh	H	—	—	—	0·9	—	—	513	—	—	—	—	—	—	—	—	—	—
									LONDON DIVISION									
101	Acton Lane	S	T	R	157·9	3×30	1×30	1,840	4×110	250	650	CG	1924	6·6	120	355	23·35	5,330	277
										600	850			22·0					
102	Bankside	S	R	B	139·0	1×60	1×60	1,750	2×375	250	690	HF	1913	11·0	60	86	13·99	3,308	68
										900	900	CG		15·0					
												OF							
103	Barking	S	R	S	597·2	2×75	2×40	6,132	10×150	350	700	HF	1925	6·6	420	2,252	25·26	8,784	1,396
							5×75		8×248	600	800	CG		12·5					
									8×256	900	925								
104	Barnes	S	R	B	6·7	—	—	100	—	200	700	CG	1924	6·6	300	2	11·32	914	2
105	Battersea	S	R	S.R.	413·7	1×100	2×69	4,050	6×250	600	850	RS	1933	3·3	120	1,605	49·0	8,784	735
							1×105		2×400	1,350	950	SS		11·0					
							1×100		3×300	600	800	H							
							1×84		2×425										
106	Beckenham	S	RT	R.Rd.	4·7	—	—	49	—	155	650	CG	1913	3·0	—	2	12·89	1,000	2
107	Blackwall Point	S	R	S	90·0	—	3×30	1,095	3×365	600	850	PF	1951	11·0	40	284	26·66	6,626	147
108	Bow	S	R	R	51·5	—	—	785	—	250	650	CG	1921	11·0	—	39	13·23	2,359	43
109	Brunswick Wharf	S	R	S	105·0	2×52·5	2×52·5	1,600	5×320	900	900	PF	1952	11·8	60	140	28·23	3,670	69
						2×60													
110	Deptford	S	R	S	361·0	3×52·5	2×30	4,796	1×220	300	675	CG	1925	11·0	120	1,034	20·73	8,784	668
							1×50		2×250	350	750			22·0					
							3×35		2×225										
									4×110										
									3×176										
									2×264										
									1×160										
111	Fulham	S	R	S	360·1	—	1×52	4,600	8×260	600	800	RS	1936	11·0	180	2,044	26·63	8,784	928
							6×60		8×315										
112	Grove Road	S	T	R	80·2	—	—	895	—	210	700	CG	1921	6·6	40	93	15·14	3,917	85
113	Hackney	S	R	B.Rd.	91·0	2×30	2×30	1,014	5×150	200	600	CG	1917	6·6	60	168	20·21	5,650	120
										370	780							
114	Hammersmith	S	R	B	20·0	—	—	229	—	200	650	CG	1922	6·6	60	6	8·73	945	9
115	Islington	S	T	R	22·0	—	—	340	1×120	180	550	CG	1922	6·6	40	10	9·43	1,408	10
116	Lombard Road	S	R	B	50·0	—	1×30	510	2×125	190	484	CG	1919	6·6	40	53	18·13	2,815	44
										300	750	SS						
117	Poplar	S	CT	B	40·0	—	—	525	—	190	530	CG	1922	6·6	40	11	9·67	961	17
										300	700							
118	St. Marylebone	S	CT	B	46·6	—	—	600	—	190	584	CG	1905	6·6	30	16	9·84	1,175	23
119	St. Pancras	S	C	Rd.	47·6	—	—	340	—	200	786	CG	1920	5·2	37	18	12·17	2,168	20

Map Ref.	Name of Station	Type of Prime Movers	Type of Cooling	Method of Fuel Delivery	Total Gen. Plant in Commission—MW	Extns. Planned or under Construction—Generating Sets	Steam Generating Sets 30 MW & above Hydro above 10 MW	Total Boiler Capacity—k lb hr	Boilers above 100 k lb hr	Steam Conditions at Turbines lb/sq in	Steam Conditions at Turbines deg F	Type of Firing	Year oldest set Commissioned	Generating Voltage kV	Cap. Associated Grid Trans. MVA	kWh Supplied in 1952—Millions	Thermal Efficiency, 1952	Hours Running, 1952	Fuel Consumed Thousand tons Coal only
							LONDON DIVISION *(continued)*												
120	Shoreditch	S	C	B	24·5	—	—	282	1×100	220	600	CG	1919	6·6	30	14	11·52	2,634	17
121	Shorts Gardens	I	—	—	2·8	—	—	—	—	—	—	—	1927	0·21	—	774	26·16	1,411	—
122	Stepney	S	R	S	81·2	—	1×30	753	3×150	180	570	CG	1924	6·6	90	126	19·57	5,522	91
										350	900	SS							
123	Taylors Lane	S	T	R	76·5	—	2×32	880	5×150	190	620	PF	1929	11·0	180	244	24·71	8,784	144
										1,300	950	CG		33·0					
124	Walthamstow	S	T	R	19·5	—	—	220	—	180	550	CG	1916	6·6	45	8	9·35	1,436	12
125	Wandsworth	S	R	B	22·0	—	—	276	—	150	610	CG	1914	11·0	40	7	8·52	931	11
126	West Ham	S	T	B.Rd.	184·0	—	5×30	2,100	2×160	200	700	CG	1923	6·6	100	341	24·01	4,862	172
									8×180	600	850			11·0					
127	Wimbledon	S	R	B.Rd.	25·2	—	—	222	—	245	650	CG	1909	10·0	30	13	10·29	2,549	17
128	Woolwich	S	R	S.B.	146·7	1×30	1×30	1,490	2×180	190	600	CG	1928	6·6	30	331	23·10	7,223	198
							3×34·5		6×165	400	800			22·0					
										600	850								
							SOUTH EASTERN DIVISION												
129	Ashford	I	—	—	2·0	—	—	—	—	—	—	—	1926	6·6	12	2	28·53	1,024	—
130	Brighton	S	S	SR	295·0	3×52·5	2×30	3,160	4×160	350	750	HF	1930	8·0	120	534	22·52	7,648	313
						1×60	2×52·5		2×350	650	850	CG		11·0					
							1×40		3×320	900	900	SS							
									4×215			PF							
131	Canterbury	S	R	Rd.	5·1	—	—	59	—	130	500	HF	1900	6·6	10	4	10·14	1,546	5
132	Croydon "A"	S	T	R	86·0	—	1×30	775	2×125	265	780	CG	1921	6·6	100	140	20·85	4,159	108
									1×150	490	800								
									1×175										
133	Croydon "B"	S	T	R	210·0	—	4×52·5	2,560	8×320	600	850	PF	1950	11·0	—	699	26·02	6,808	378
134	Eastbourne	S	T	R	9·0	—	—	110	—	250	650	CG	1923	2·2	40	5	10·80	1,342	6
135	E. Grinstead	I	—	—	0·4	—	—	—	—	—	—	—	1923	0·46	4	0·2	20·22	997	—
136	Epsom	I	—	—	1·0	—	—	—	—	—	—	—	1927	6·6	10	0·7	25·12	933	—
137	Faversham	I	—	—	0·4	—	—	—	—	—	—	—	1921	0·5	—	0·5	13·30	5,358	—
138	Folkestone	S	T	R	7·1	—	—	56	—	200	550	CG	1922	6·6	—	5	11·27	1,844	6
139	Gravesend	S	W	B	12·0	—	—	150	—	215	540	CG	1921	6·6	30	12	12·24	2,089	13
140	Guildford	S	R	Rd.	11·2	—	—	150	—	250	700	CG	1927	6·6	30	9	12·58	1,652	9
141	Hastings	S	T	R	14·2	—	—	187	—	250	650	CG	1923	6·6	30	20	14·57	2,447	18
142	Horsham	I	—	—	0·7	—	—	—	—	—	—	—	1926	6·6	15	0·5	20·78	859	—
143	Kingston	S	R	B.Rd.	128·7	—	4×30	1,790	6×285	225	750	CG	1923	3·3	45	590	25·42	7,521	272
										600	825			11·5					
144	Lewes	I	—	—	1·2	—	—	—	—	—	—	—	1907	0·46	6	0·8	25·24	1,338	—
145	Littlebrook	S	R	S	300·0	3×60	4×60	3,316	6×256	600	800	CG	1939	15·0	90	1,405	29·95	8,724	731
							2×30		4×265	1235	825	PF		11·8					
									2×360	900	900								
1		3	4	5	6	7	8	9	10	11		12	13	14	15	16	17	18	19
146	Maidstone	S	RT	B	15·2	—	—	150	—	225	700	CG	1908	6·6	37	6	11·29	1,505	6
147	Newhaven	I	—	—	0·6	—	—	—	—	—	—	—	1911	6·6	6	0·4	22·69	1,158	—
148	Portsmouth	S	T	Rd.	3·0	—	—	30	—	210	630	CG	1924	6·6	5	1	6·55	1,756	2
													1914	3·46	1	0·5	24·84	630	—

1	2	3	4	5	6	7	8	9	10	11		12	13	14	15	16	17	18	19
146	Maidstone	S	RT	B	15·2	—	—	150	—	225	700	CG	1908	6·6	37	6	11·29	1,505	6
147	Newhaven	I	—	—	0·6	—	—	—	—	—	—	—	1911	6·0	6	0·1	22·69	1,138	—
148	Ramsgate	S	T	Rd.	3·0	—	—	30	—	210	630	CG	1924	6·6	5	1	6·55	1,756	2
149	Sevenoaks	I	—	—	0·9	—	—	—	—	—	—	—	1914	3·46	1	0·5	24·84	630	—
150	Thanet	S	T	R	6·0	—	—	70	—	200	538	CG	1914	2·75	15	4	8·01	1,480	6
151	Tonbridge	I	—	—	0·2	—	—	—	—	—	—	—	1914	0·44	—	0·1	26·99	852	—
152	Tunbridge Wells	S	T	R	11·2	—	—	120	—	240	666	CG	1924	6·6	30	8	11·39	1,809	9
153	Woking	S	CT	Rd.	7·0	—	—	80	—	175*	650	CG	1918	2·0	30	2	8·13	772	4
154	Worthing	I	—	—	2·3	—	—	—	—	—	—	—	1912	0·5	30	2	23·70	1,016	—
	SOUTHERN DIVISION																		
155	Basingstoke	I	—	—	2·1	—	—	—	—	—	—	—	1925	11·0	10	1	25·94	1,121	—
156	Cowes	S	R	B	13·0	—	—	142	—	190	670	CG	1928	11·0	40	35	17·16	5,508	27
157	Downton	IH	—	—	0·1	—	—	—	—	—	—	—	1930	0·42	—	0·1	21·77	1,707	—
158	Earley	S	R	R	120·0	—	3×40	1,400	7×200	615	815	PF	1942	33·0	85	197	25·38	7,144	254
159	Farnborough	I	—	—	0·9	—	—	—	—	—	—	—	1913	3·0	—	0·5	14·15	128	—
160	Farnham	I	—	—	0·3	—	—	—	—	—	—	—	1912	2·0	10	0·2	24·76	748	—
161	Frome	S	T	Rd.	2·3	—	—	37	—	160	600	CG	1902	11·0	—	2	10·59	1,819	3
162	High Wycombe	SI	RW	Rd.	4·0	—	—	52	—	155	600	CG	1912	6·6	—	5	13·29	1,887	5
163	Hindhead	I	—	—	0·6	—	—	—	—	—	—	—	1916	2·0	7	0·5	28·61	720	—
164	Hounslow	SI	W	B	4·6	—	—	37	—	200	550	CG	1915	0·5	40	3·2	28·97	1,040	3
														0·4					
165	Lymington	I	—	—	0·5	—	—	—	—	—	—	—	1929	0·4	—	0·3	28·38	674	—
166	Newbury	I	—	—	0·5	—	—	—	—	—	—	—	1924	0·5	—	0·3	25·17	806	—
167	Oxford	S	R	Rd.	22·5	—	—	250	—	240	650	CG	1923	11·0	30	31	13·37	3,339	34
168	Poole	S	S	S	200·0	—	4×50	2,340	6×340	900	925	PF	1950	11·8	232	966	28·11	8,705	429
									1×300										
169	Portsmouth	S	S	S	140·0	—	4×30	1,731	2×135	245	700	CG	1927	6·6	45	477	24·62	8,151	272
									2×180	600	850			11·0					
									5×165										
170	Reading	S	R	Rd.	14·5	—	—	160	—	160	550	CG	1923	3·5	30	12	11·29	1,843	14
171	Ringwood	IH	—	—	0·1	—	—	—	—	—	—	—	1925	0·42	—	0·3	21·87	7,824	—
172	Salisbury	S	R	R	2·9	—	—	49	—	185	650	CG	1925	11·0	—	4	10·10	1,959	5
173	Southampton	S	S	Rd.	88·0	—	—	856	3×192	200	750	CG	1922	6·6	40	187	21·19	6,320	142
										400	800								
174	Swindon	S	T	R.Rd.	35·0	—	—	360	2×120	270	700	CG	1927	6·6	30	65	19·60	3,445	57
										400	800								
175	Uxbridge	S	C	B	4·2	—	—	81	—	200	600	CG	1900	6·6	20	3	7·89	1,014	5
176	Weymouth	S	S	Rd.	4·6	—	—	76	—	200	650	CG	1927	6·6	20	5	10·74	1,666	6
177	Yeovil	I	—	—	0·8	—	—	—	—	—	—	—	1925	0·18	—	0·7	28·00	1,299	—
	SOUTH WESTERN DIVISION																		
178	Barnstaple	I	—	—	2·1	—	—	—	—	—	—	—	1929	6·6	—	2	29·45	2,095	—
179	Bath	S	R	R.Rd.	20·0	—	—	200	—	200	600	CG	1921	6·6	30	27	12·61	3,208	28
180	Bideford	I	—	—	1·1	—	—	—	—	—	—	—	1926	3·3	—	1	28·29	1,494	—
181	Bridport	I	—	—	0·9	—	—	—	—	—	—	—	1929	6·6	—	1	28·04	1,210	—
182	Bude	I	—	—	0·5	—	—	—	—	—	—	—	1927	0·42	—	0·3	27·66	1,019	—
183	Castle Meads	S	R	R	40·1	—	—	500	5×100	400	800	CG	1942	11·0	50	182	23·82	7,052	106
184	Chagford	H	—	—	0·03	—	—	—	—	—	—	—	1916	0·42	—	0·1	—	4,605	—
185	East Yelland	I	—	—	0·22	5×30	—	—	—	—	—	—	1929	0·42	1	0·2	27·58	945	—
186	Exeter	S	RC	R	13·5	—	—	155	—	195	566	CG	1922	6·6	20	15	10·96	2,458	16
187	Feeder Road (Bristol)	S	CT	S	31·7	—	—	336	—	200	600	CG	1901	6·6	—	4	6·26	849	9
188	Hayle	S	S	S	67·8	—	—	760	1×200	235	730	HF	1928	11·0	60	275	22·45	8,784	151
									4×100	400	800	CG							
189	Ilfracombe	I	—	—	0·7	—	—	—	—	—	—	—	1927	0·48	—	0·5	30·25	1,540	—

Map Ref.	Name of Station	Type of Prime Movers	Type of Cooling	Method of Fuel Delivery	Total Gen. Plant in Commission—MW	Extns. Planned or under Constructn.—Generating Sets	Steam Generating Sets 30 MW & above Hydro Above 10 MW	Total Boiler Capacity—k lb hr	Boilers above 100 k lb hr	Steam Conditions at Turbines lb/sq in	deg F	Type of Firing	Year oldest set Commissioned	Generating Voltage kV	Cap. Associated Grid Trans. MVA	kWh Supplied in 1952—Millions	Thermal Efficiency, 1952	Hours Running, 1952	Fuel Consumed Thousand tons Coal only
										SOUTH WESTERN DIVISION (*continued*)									
190	Kensham	H	—	—	0·03	—	—	—	—	—	—	—	1934	0·42	—	0·2	—	8,489	—
191	Marytavy	IH	—	—	3·9	—	—	—	—	—	—	—	1928	0·42	—	7	32·06	5,671	—
192	Minehead	I	—	—	0·6	—	—	—	—	—	—	—	1909	0·5	—	0·1	20·92	533	—
193	Morwellham	H	—	—	0·7	—	—	—	—	—	—	—	1934	0·42	—	3	—	8,587	—
194	Newton Abbot	S	RT	R	51·8	—	—	666	4×100	150	515	CG	1902	11·0	30	121	20·33	6,004	88
										250	700								
										400	800								
195	Okehampton	I	—	—	0·07	—	—	—	—	—	—	—	1927	0·42	—	—	12·32	18	—
196	Plymouth	S	RS	S	160·2	—	3×31·5	1,520	4×100	600	850	CG	1925	6·6	150	328	25·69	6,552	187
									3×320	230	588	PF		33·0					
										400	800								
197	Portishead	S	S	S	248·1	4×60	2×51·52	2,720	8×162·5	300	800	CG	1929	33·0	120	977	20·76	8,784	570
							2×52		4×250										
198	St. Austell	I	—	—	0·8	—	—	—	—	—	—	—	1927	0·4	—	0·8	27·66	1,482	—
199	South Molton	I	—	—	0·2	—	—	—	—	—	—	—	1929	0·44	—	0·3	24·76	3,228	—
200	Taunton	S	R	Rd.	3·0	—	—	25	—	200	600	CG	1930	6·6	30	2	13·25	1,254	1
201	Weston-super-Mare	S	T	R	2·6	—	—	65	—	200	450	CG	1923	6·6	10	3	11·35	3,593	3
										EASTERN DIVISION									
202	Aldeburgh	I	—	—	0·2	—	—	—	—	—	—	—	1908	0·4	—	—	24·66	739	—
203	Bedford	S	R	R	20·0	—	—	209	—	190	650	CG	1925	6·6	90	19	13·28	2,016	21
204	Brimsdown	S	CT	R.B.	220·5	1×60	1×53	1,905	2×165	1900	930	CG	1928	33·0	185	688	26·41	7,818	403
							1×60		2×187·5	315	750	PF							
									4×200	1900	930								
									2×360										
205	Cambridge	S	R	Rd.	7·3	—	—	87	—	200	700	CG	1932	11·0	—	12	14·49	2,570	12
206	Clacton	I	—	—	1·8	—	—	—	—	—	—	—	1921	6·6	10	0·6	21·76	736	—
207	Cliff Quay	S	R	S	276·0	—	6×46	2,920	8×365	600	825	PF	1949	11·8	60	1,340	26·62	8,783	693
208	Colchester	S	RP	R	7·5	—	—	82	—	240	650	CG	1927	6·6	30	3	9·31	967	4
209	Cromer	I	—	—	0·2	—	—	—	—	—	—	—	1911	3·3	—	—	24·95	470	—
210	Finchley	S	PT	Rd.	4·7	—	—	50	—	170	600	CG	1926	6·6	4	—	4·11	328	1
211	Frinton	I	—	—	0·3	—	—	—	—	—	—	—	1912	0·48	4	0·1	23·08	1,802	—
212	Great Yarmouth	S	R	S	14·7	—	—	230	1×108	250	650	CG	1922	6·6	120	23	14·01	2,981	23
213	Ipswich	S	R	S	17·2	—	—	267	—	250	640	CG	1919	6·6	30	15	12·69	1,763	16
214	King's Lynn	S	R	R	5·2	—	—	75	—	200	625	CG	1921	6·6	30	2	11·34	1,040	3
215	Letchworth	S	T	R	26·5	—	—	315	—	200	670	CG	1925	3·3	10	91	18·01	7,651	77
										300	850			11·0					
216	Little Barford	S	RT	R	120·0	—	4×30	1,200	1×300	650	900	PF	1941	11·0	85	385	25·26	7,393	216
217	Luton	S	T	R	24·5	—	—	260	—	200	650	HF	1920	6·6	60	27	13·95	2,662	27
										300	700	RS							
												PF							
1	2	3	4	5	6	7	8	9	10	11		12	13	14	15	16	17	18	19

218	Norwich	S	R	S.B.	73·5	—	1×31	970	4×120	250	700	HF	1922	6·6	60	168	23·02	5,165	113
									1×100	650	850	CG							
									3×160	230	700	PF	1928	6·6	60	76	21·95	4,293	55
									1×100	400	800			11·0					
		S	R	R	58·5	—	—	690							90	133	24·18	5,069	78

1	2	3	4	5	6	7	8	9	10	11		12	13	14	15	16	17	18	19
218	Norwich	S	R	S.R.	73·5	—	1×31	970	4×120	250	700	HF	1922	6·6	60	168	23·92	5,165	112
									1×100	650	850	CG							
219	Peterborough	S	R	R	58·5	—	—	690	3×160	230	700	PF	1928	6·6	60	76	21·95	4,293	55
									1×100	100	800			11·0					
220	Rye House	S	T	R	61·0	2×32	2×32	1,050	3×350	600	850	PF	1951	33·0	90	133	24·18	5,069	78
221	Southend, Leigh	I	—	—	0·8	—	—	—	—	—	—	—	1920	0·5	15	0·2	19·63	389	—
222	Southend, Ludn Rd	I	—	—	4·8	—	—	8	—	—	—	—	1921	0·5	45	1	23·81	692	—
223	Watford	S	RT	R	37·7	—	—	300	1×100	250	750	CG	1918	6·6	30	44	17·07	3,833	37
									EAST MIDLANDS DIVISION										
224	Burton	S	R	R.Rd.	43·5	—	—	536	—	200	620	CG	1924	3·3	30	120	22·58	7,099	87
										350	780			11·0					
225	Chesterfield	S	T	R.Rd.	5·5	—	—	102	—	155	500	HF	1918	6·6	—	10	8·65	3,468	12
226	Coventry	S	T	Rd.R.B.	130·7	—	3×30·75	1,300	6×150	300	700	CG	1928	6·6	180	237	18·14	5,256	203
														33·0					
227	Derby	S	R	R.Rd.	65·5	—	1×30	695	4×130	170	520	PF	1922	6·6	—	179	20·80	6,534	135
										300	750			33·0					
228	East Retford	I	—	—	0·4	—	—	—	—	—	—	—	1929	6·6	—	—	14·11	210	—
229	Hinckley	S	C	Rd.	6·0	—	—	86	—	180	530	CG	1921	6·6	—	5	9·85	1,855	9
230	Kettering	S	T	Rd.	7·0	—	—	104	—	180	650	CG	1914	6·6	—	3	9·62	957	5
231	Leicester	S	RT	R	152·2	—	2×31·5	1,585	7×175	250	700	PF	1924	6·6	60	563	25·00	8,273	403
							1×30		3×120	350	750			33·0					
										650	800			13·2					
232	Lincoln	S	RT	R	46·0	—	—	648	4×120	190	600	CG	1921	6·6	30	127	21·72	7,827	90
										400	800								
233	Loughborough	S	C	Rd.	4·5	—	—	91	—	200	600	CG	1917	6·6	30	3	10·76	1,136	4
234	Northampton	S	RT	R	112·5	1×30	3×30	1,160	4×150	200	675	CG	1926	6·6	45	276	23·15	6,613	197
									2×175	400	800			33·0					
235	Nottingham	S	R	R	254·0	1×60	1×52·5	2,580	8×175	250	670	HF	1925	11·0	120	1,199	23·93	8,784	758
							1×53		4×320	600	850	PF		33·0					
							3×30												
236	Spondon	S	RT	R.Rd.	172·0	—	4×30	1,920	6×160	215	685	CG	1925	6·6	60	755	20·98	8,784	532
										350	685			11·0					
237	Staythorpe	S	R	R	180·0	4×60	3×60	2,400	10×240	900	900	SS	1950	15·0	120	761	26·18	8,757	430
238	Warwick	S	R	R	42·0	—	—	340	—	250	650	CG	1924	6·6	60	89	20·74	4,917	67
										350	750			12·0					
									MIDLANDS DIVISION										
239	Birchills	S	C	Rd.	17·5	—	—	225	—	190	625	PF	1922	6·6	—	10	12·00	1,814	14
										290	740								
240	Hams Hall	S	T	R	570·4	5×60	3×51·5	6,720	5×180	350	730	HF	1929	11·0	255	2,198	26·24	8,784	1,459
							3×30·4		6×275	650	825	CG		33·0					
							6×53·5		9×250			PF							
									6×320										
241	Ironbridge	S	R	Rd.R.	200·0	—	4×50	2,525	3×225	375	750	CG	1933	33·0	180	731	22·74	8,258	498
									5×270										
									2×250										
242	Market Drayton	I	—	—	0·09	—	—	—	—	—	—	—	1932	0·48	—	—	25·48	247	—
243	Meaford	S	T	Rd.R.	120·0	4×60	4×30	1,440	6×240	600	825	PF	1948	11·8	132	811	25·62	8,724	423
									3×515										
244	Nechells	S	T	B.Rd.R.	256·2	1×52·5	3×52·5	2,713	3×150	300	700	HF	1922	11·0	180	591	25·70	8,688	325
									7×230	650	825	CG							
245	Newcastle-u-Lyme	I	—	—	0·4	—	—	—	—	—	—	—	1933	0·48	—	0·1	27·42	408	—
246	Ocker Hill	S	T	R.B.	60·0	2×30	2×30	900	5×180	600	850	CG	1947	33·0	120	226	22·80	6,366	188
247	Rousbill	I	—	—	1·0	—	—	—	—	—	—	—	1922	0·45	—	—	13·55	548	—

Map Ref.	Name of Station	Type of Prime Movers	Type of Cooling	Method of Fuel Delivery	Total Gen. Plant in Commission—MW	Extns. Planned or under Constructn.—Generating Sets	Steam Generating Sets 30 MW & above: Hydro above 10 MW	Total Boiler Capacity—k lb hr	Boilers above 100 k lb hr	Steam Conditions at Turbines lb/sq in	Steam Conditions at Turbines deg F	Type of Firing	Year oldest set Commissioned	Generating Voltage kV	Cap. Associated Grid Trans. MVA	kWh Supplied in 1952—Millions	Thermal Efficiency, 1952	Hours Running, 1952	Fuel Consumed Thousand tons Coal only
										MIDLANDS DIVISION (*continued*)									
248	Stafford	S	R	Rd.	6·0	—	—	107	—	170	525	CG	1925	6·6	45	2	7·44	1,031	5
249	Stoke	S	T	Rd.	37·0	—	—	360	—	200	640	CG	1919	6·6	90	34	12·79	3,041	36
										250	650								
250	Stourport	S	R	R.Rd.	241·7	1×60	1×35	2,561	8×182	325	675	HF	1926	33·0	240	893	28·84	7,636	566
							1×60		1×525	625	825	CG		11·0					
							3×30			1,250	950	PF							
251	Sutton Coldfield	S	R	R	1·0	—	—	18	—	150	550	CG	1927	0·46	—	—	5·14	339	1
252	Walsall	S	T	R.B.	120·0	2×30	4×30	1,800	10×180	600	850	UG	1949	33·0	150	544	24·08	7,696	382
253	Wolverhampton	S	T	B	30·0	—	1×30	480	4×120	420	825	CG	1942	6·6	90	18	20·73	805	16
254	Worcester	S	R	R	40·5	—	—	450	3×150	215	590	CG	1918	6·6	30	107	20·52	5,406	80
										400	800								
										SOUTH WALES DIVISION									
255	Aberayron	I	—	—	0·1	—	—	—	—	—	—	—	1927	0·23	—	—	16·24	1,046	—
256	Bridgend	S	T	R	2·0	—	—	25	—	150	480	HF	1927	6·6	—	2	7·95	1,344	2
257	Cardiff	S	RT	R	87·6	—	2×30	1,040	4×180	200	588	CG	1905	6·6	90	324	21·71	7,479	214
										600	850			33·0					
258	Cyfarthfa	H	—	—	0·1	—	—	—	14·5ft	—	—	—	1931	0·6	—	0·2	—	6,064	—
259	Haverfordwest	I	—	—	6·0	—	—	—	—	—	—	—	1931	11·0	—	13	27·72	5,143	—
260	Lampeter	I	—	—	0·4	—	—	—	—	—	—	—	1912	0·24	—	0·1	19·55	1,012	—
261	Llandrindod Wells	I	—	—	0·2	—	—	—	—	—	—	—	1928	0·48	—	—	20·15	489	—
262	Llandyssul	IH	—	—	0·1	—	—	—	15ft	—	—	—	1910	0·25	—	—	12·85	4,305	—
263	Llanelly	S	S	R	28·0	—	—	280	—	250	700	CG	1920	6·6	90	—	14·56	5,092	55
264	Llynfi	S	T	R	120·0	—	4×30	1,200	4×300	650	909	PF	1943	11·0	—	752	26·23	8,784	368
265	Lydney	RT	R.Rd.		17·5	—	—	155	—	250	650	CG	1923	6·6	60	28	12·98	4,406	30
266	Milford Haven	I	—	—	0·8	—	—	—	—	—	—	—	1926	0·44	—	1	24·25	4,774	—
267	Monmouth	IH	—	—	0·1	—	—	—	10ft	—	—	—	1923	3·0	—	0·3	—	3,505	—
268	Newport	S	R	R	84·5	—	2×30	950	2×150	250	650	CG	1922	6·2	90	425	24·82	8,739	257
									2×180	600	850			11·8					
269	Penarth	S	T	R	2·0	—	—	25	—	160	520	CG	1924	6·0	—	1	11·00	1,326	2
270	Penydarren	S	R	R	0·5	—	—	15	—	160	420	HF	1901	0·55	—	—	3·84	1,274	1
271	Pont-y-cafnau	H	—	—	0·2	—	—	—	53ft	—	—	—	1929	0·6	—	0·7	—	7,954	—
272	Pontypridd	S	R	R	1·8	—	—	18	—	200	550	HF	1905	0·5	—	1	6·35	1,144	2
273	Tir John	S	S	R	156·2	—	2×30	1,880	4×240	250	795	PF	1931	6·6	60	763	19·51	8,784	539
							2×37·5		4×230	600	825			33·0					
274	Upper Boat	S	RT	R	155·0	—	3×30	1,754	5×182	325	725	CG	1924	33·0	90	784	23·53	8,784	496
									1×364	625	825	SS							
275	Uskmouth	S	R	R	60·0	6×60	1×60	1,080	3×360	900	900	PF	1952	11·8	420	6	21·46	228	
1	2	3	4	5	6	7	8	9	10	11		12	13	14	15	16	17	18	19
										MERSEYSIDE AND NORTH WALES DIVISION									
[illegible]	[illegible]	I	—	—	4·2	—	—	—	—	—	—	—	1915	6·6	—	10	20·64	8,784	—
277	Birkdale	I	—	—	0·6	—	—	—	—	—	—	—	1908	0·48	—	0·2	23·95	548	—
278	Bromborough	S	R	R	200·0	—	4×50	2,100	7×300	900	900	PF	1951	11·0	—	446	28·88	7,189	216
279	Clarence Dock	S	R	R	308·5	1×51·5	4×51·5	4,290	9×200	400	750	CG	1951	7·25	195	1,396	23·72	8,783	824
							2×51·25		4×140	600	800	SS		33·0					

1	2	3	4	5	6	7	8	9	10	11		12	13	14	15	16	17	18	19
MERSEYSIDE AND NORTH WALES DIVISION																			
276	Abergavenny	I	—	—	4·9	—	—	—	—	—	—	—	1915	6·6	—	10	20·64	8,784	—
277	Birkdale	I	—	—	0·6	—	—	—	—	—	—	—	1908	0·18	—	0·2	23·95	548	—
278	Bromborough	S	R	R	200·0	—	4 × 50	2,100	7 × 300	900	900	PF	1951	11·0	—	446	28·88	7,180	216
279	Clarence Dock	S	R	R	308·5	1 × 51·5	4 × 51·5	4,290	9 × 200	400	750	CG	1931	7·25	195	1,396	23·72	8,783	824
							2 × 51·25		4 × 160	600	800	SS		33·0					
									1 × 250										
									6 × 350										
280	Cwm Dyli	H	—	—	6·5	—	—	122	1,100ft	—	—	—	1906	10·0	3	10	—	3,583	—
281	Dolgarrog	H	—	—	17·7	—	—	324	1,130ft	—	—	—	1919	6·6	30	51	—	8,782	—
									830ft										
282	Dolgelley	IH	—	—	0·1	—	—	—	250ft	—	—	—	1934	0·4	—	0·6	26·38	5,762	—
283	Ffestiniog	H	—	—	0·6	—	—	—	170ft	—	—	—	1937	0·4	7	2·5	—	8,034	—
284	Lister Drive	S	T	R	50·7	—	—	735	3 × 125	275	675	CG	1926	6·3	—	95	14·52	2,259	89
285	Machynlleth	IH	—	—	0·5	—	—	—	—	—	—	—	1932	0·42	1	1·1	29·65	7,217	—
286	Maentwrog	H	—	—	24·0	—	—	1,200	620ft	—	—	—	1928	6·6	34	35	—	5,131	—
287	Marchwiel	S	T	R	12·1	—	—	200	—	230	630	CG	1941	11·0	10	20	14·10	3,072	19
288	Percival Lane	S	C	R	115·0	—	3 × 30	1,405	6 × 187·5	250	650	CG	1921	6·45	90	365	23·02	8,659	191
										400	800			11·0					
289	Queensferry	S	P	R	5·5	—	—	112	—	160	500	SS	1916	0·44	7	5	6·94	1,257	10
290	St. Helens	S	T	R	24·0	—	—	190	—	250	700	CG	1921	6·6	120	54	14·87	5,863	51
291	Southport	S	T	R	17·2	—	—	134	—	250	700	CG	1921	6·6	30	11	13·55	2,716	11
292	Towyn	IH	—	—	0·9	—	—	—	—	—	—	—	1935	0·42	—	1·2	28·38	4,027	—
293	Wallasey	S	S	R	22·5	—	—	215	—	190	605	CG	1923	6·6	23	37	15·14	4,404	35
294	Warrington	S	R	R	90·0	—	1 × 30	1,000	5 × 200	400	800	CG	1942	6·6	45	221	22·59	6,354	128
295	Wrexham	S	R	Rd.	0·8	—	—	18	—	155	500	HF	1900	0·48	—	—	3·04	589	1
YORKSHIRE DIVISION																			
296	Barnsley	S	T	Rd.	6·0	—	—	75	—	150	516	CG	1921	3·3	15	2	9·31	991	4
297	Barugh	S	PT	Rd.	10·0	—	—	105	—	170	580	CG	1922	6·6	—	12	9·96	3,108	17
298	Blackburn Meadows	S	T	R.Rd.	185·0	—	2 × 30	2,120	3 × 100	580	800	CG	1932	11·4	120	725	22·39	8,415	457
							2 × 50		9 × 160										
									2 × 190										
299	Bradford	S	T	R.Rd.	127·5	—	2 × 30	1,395	6 × 180	625	825	CG	1925	33·0	57	366	23·09	7,394	226
										190	754	SS		6·6					
												RS							
300	Doncaster	S	C	B	13·5	4 × 30	—	130	—	200	550	CG	1923	3·2	40	13	12·37	2,447	14
301	Ferrybridge	S	R	R.B.	170·0	2 × 100	2 × 42·5	2,296	8 × 130	275	650	CG	1927	10·8	120	978	23·78	8,784	566
							1 × 45		4 × 200										
										600	850			10·5					
302	Gainsborough	I	—	—	0·3	—	—	—	—	—	—	—	1927	6·6	—	—	—	5	—
303	Grimsby	S	T	R	38·0	—	—	425	—	225	800	CG	1924	6·6	30	81	16·56	5,685	52
304	Halifax	S	T	R.Rd.	48·3	—	—	478	2 × 110	200	640	CG	1922	6·6	120	109	17·76	5,598	79
									2 × 100	350	750								
305	Huddersfield	S	T	Rd.	40·0	2 × 30	—	480	4 × 120	350	750	CG	1938	6·8	90	277	21·69	8,584	165
306	Keadby	S	R	R	120·0	4 × 60	2 × 60	1,100	2 × 550	900	900	PF	1952	11·0	—	120	24·13	3,053	69
307	Kirkstall	S	RT	R.B.Rd.	200·0	—	5 × 30	2,370	3 × 250	450	720	PF	1930	33·0	120	692	24·17	8,628	488
									3 × 160	600	850								
									3 × 200										
									3 × 180										
308	Mexborough	S	R	R.Rd.	60·0	2 × 30	2 × 30	720	4 × 180	600	850	CG	1945	10·5	—	361	24·36	8,731	191
309	Neepsend	S	T	R.Rd.	160·0	2 × 50	2 × 30	1,940	5 × 160	600	825	CG	1936	11·4	120	514	22·37	7,005	337
							2 × 50		6 × 190										
310	Rotherham	S	RCT	R.B.Rd.	160·0	—	2 × 30	1,800	10 × 180	600	850	CG	1939	11·0	100	769	24·82	8,784	408
							1 × 50												
311	Sculcoates	S	T	R.Rd.	122·0	—	2 × 30	1,492	3 × 187·5	240	600	CG	1925	6·6	60	426	21·34	8,694	253
									5 × 110	375	800			22·0					
									2 × 190										

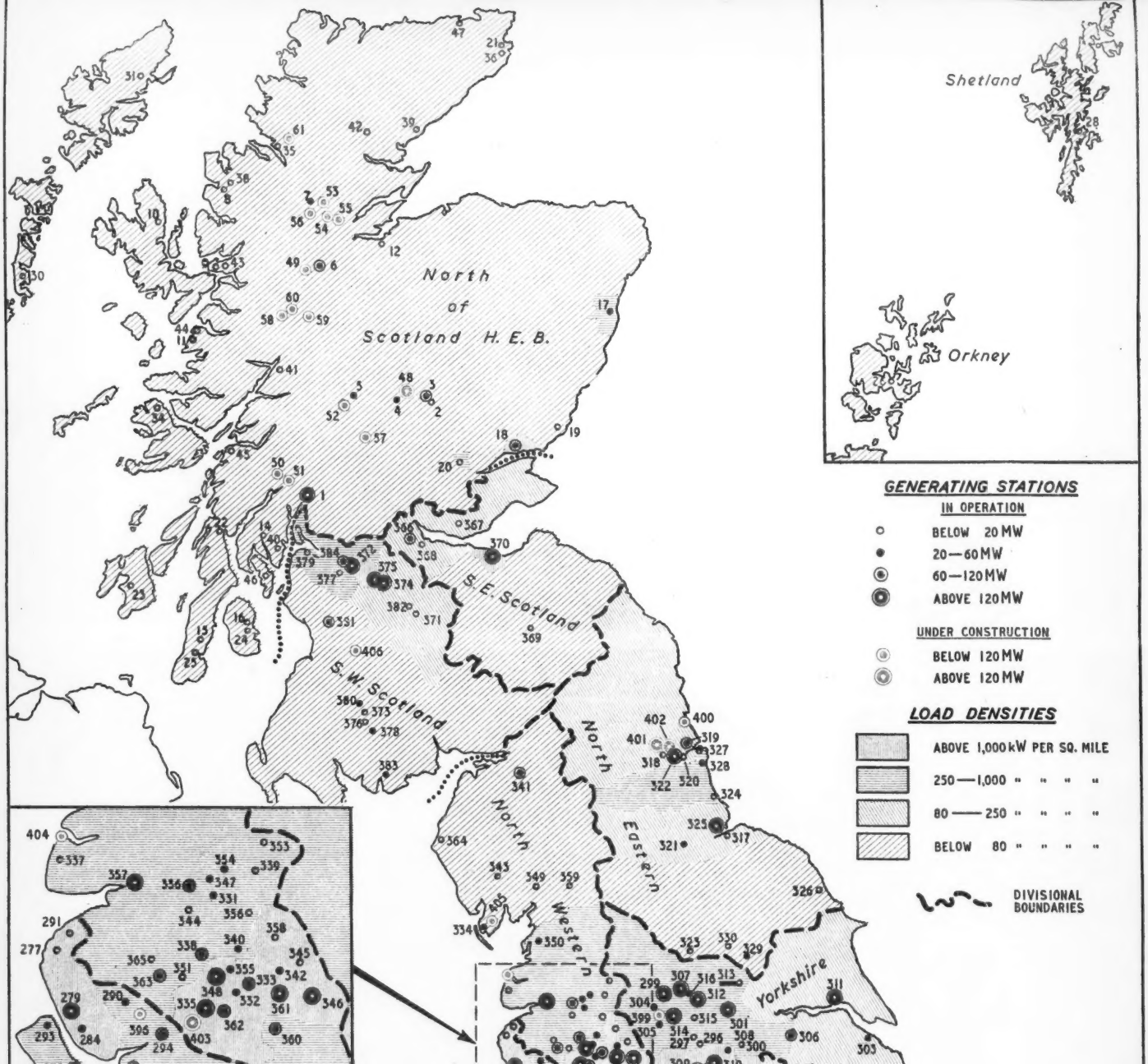
Map Ref.	Name of Station	Type of Prime Movers	Type of Cooling	Method of Fuel Delivery	Total Gen. Plant in Commission—MW	Extns. Planned or under Constructn.—Generating Sets	Steam Generating Sets 30 MW & above Hydro above 10 MW	Total Boiler Capacity—k lb hr	Boilers above 100 k lb hr	Steam Conditions at Turbines lb/sq in	deg F	Type of Firing	Year oldest set Commissioned	Generating Voltage kV	Cap. Associated Grid Trans. MVA	kWh Supplied in 1952—Millions	Thermal Efficiency, 1952	Hours Running, 1952	Fuel Consumed Thousand tons Coal only
							YORKSHIRE DIVISION *(continued)*												
312	Skelton Grange	S	RT	R.Rd.	180·0	3×60	3×60	1,800	5×360	900	925	PF	1951	11·0	—	763	29·19	8,784	397
313	Tadcaster	IH	—	—	0·4	—	—	—	—	—	—	—	1912	0·48	—	0·1	36·09	4,936	—
314	Thornhill	S	R	R.B.Rd.	150·0	1×45	2×45 2×30	1,920	6×200	423	756	CG	1932	10·5	120	371	21·56	7,219	228
315	Wakefield	S	R	Rd.	12·0	4×60	—	120	—	175	525	CG	1922	6·6	30	7	8·95	1,612	11
316	Whitehall Road	S	R	B.Rd.	37·0	—	—	480	—	170	525	CG	1923	6·75	—	27	10·15	2,311	55
							NORTH EASTERN DIVISION												
317	Ayresome	S	R	—	3·0	—	—	—	—	130	350	—	1934	2·9	—	11	13·01	6,436	—
318	Blaydon	S	T	—	1·1	—	—	80	—	190	480	—	1933	5·75	—	5	8·68	8,438	—
319	Carville	S	R	Rd.R.	62·5	—	—	672	—	250	650	CG	1916	5·75	—	142	16·17	5,443	123
320	Close	S	R	R	12·5	—	—	213	—	200	600	CG	1902	6·0	30	18	11·39	3,417	20
321	Darlington	S	T	Rd.R.	60·0	—	—	720	6×120	400	750	CG	1940	6·3	30	—	—	—	—
322	Dunston	S	R	R	347·5	—	6×50	3,250	8×105 2×410 7×135	600 600 190	850 800 600	HF CG PF	1920	13·5 11·0 5·75	60	1,976	29·65	8,784	1,059
323	Harrogate	S	P	Rd.	15·9	—	—	124	—	175 300	600 700	SS CG	1922	3·66 11·0	20	6	13·42	1,252	6
324	Horden	S	T	—	6·0	—	—	80	—	250	650	—	1934	2·75	—	32	15·28	8,773	—
325	North Tees	S	R	R	290·0	1×60	3×60	3,215	5×360 2×180	450 900	650 925	HF CG PF	1921	11·5 11·0	120	651	26·73	7,441	413
326	Scarborough	S	TP	Rd.	9·4	—	—	80	—	250	700	CG	1928	6·6	35	9	13·08	2,026	10
327	South Shields	S	R	B	10·5	—	—	180	—	160 230	500 600	CG	1921	2·25	20	14	11·72	2,286	16
328	Sunderland	S	T	R	60·0	—	—	663	3×121	250 400	650 800	CG	1925	5·0 5·25	20	123	21·32	4,065	97
329	York, Foss Islands	S	RT	R	32·0	—	—	270	2×100	190 400	583 750	CG	1926	3·3 11·0	40	41	21·79	2,727	35
330	York, Linton Lock	H	—	R	0·7	—	—	—	12ft	—	—	—	1923	6·6	—	1	—	3,875	—
							NORTH WESTERN DIVISION												
331	Accrington	S	RT	Rd.	21·2	—	—	160	—	195	600	CG	1921	6·6	20	19	10·55	2,959	23
332	Agecroft L.P.	S	R	R.Rd.	58·1	—	—	550	—	300	700	CG	1924	6·6	20	49	14·82	2,365	42
333	Agecroft H.P.	S	T	R.Rd.	105·0	—	2×52·5	1,260	4×315	600	850	PF	1950	33·0	90	571	27·20	8,752	309
334	Barrow	S	T	R	25·0	—	—	265	—	195	650	CG	1914	6·6	3	49	16·20	4,675	40
335	Barton	S	C	R.B.	161·5	—	1×41 1×51·5	1,775	2×125 1×140 1×130 2×200	350	700	CG	1923	33·0	120	361	18·01	6,649	278
1	2	3	4	5	6	7	8	9	10	11		12	13	14	15	16	17	18	19
[illegible]	[illegible]kburn	S	T	R.B.	110·0	1×40	1×30 2×40	1,350	9×150	600	850	CG	1942	33·0	60	243	22·81	8,322	136
337	Blackpool	S	T	Rd.	12·5	—	—	133	—	245	600	CG	1923	6·6	—	3	7·20	512	6
338	Bolton	S	RTP	R	107·5	—	3×31·25	990	6×165	200 400	538 800	CG	1923	6·6 11·0	130	293	21·13	6,518	186

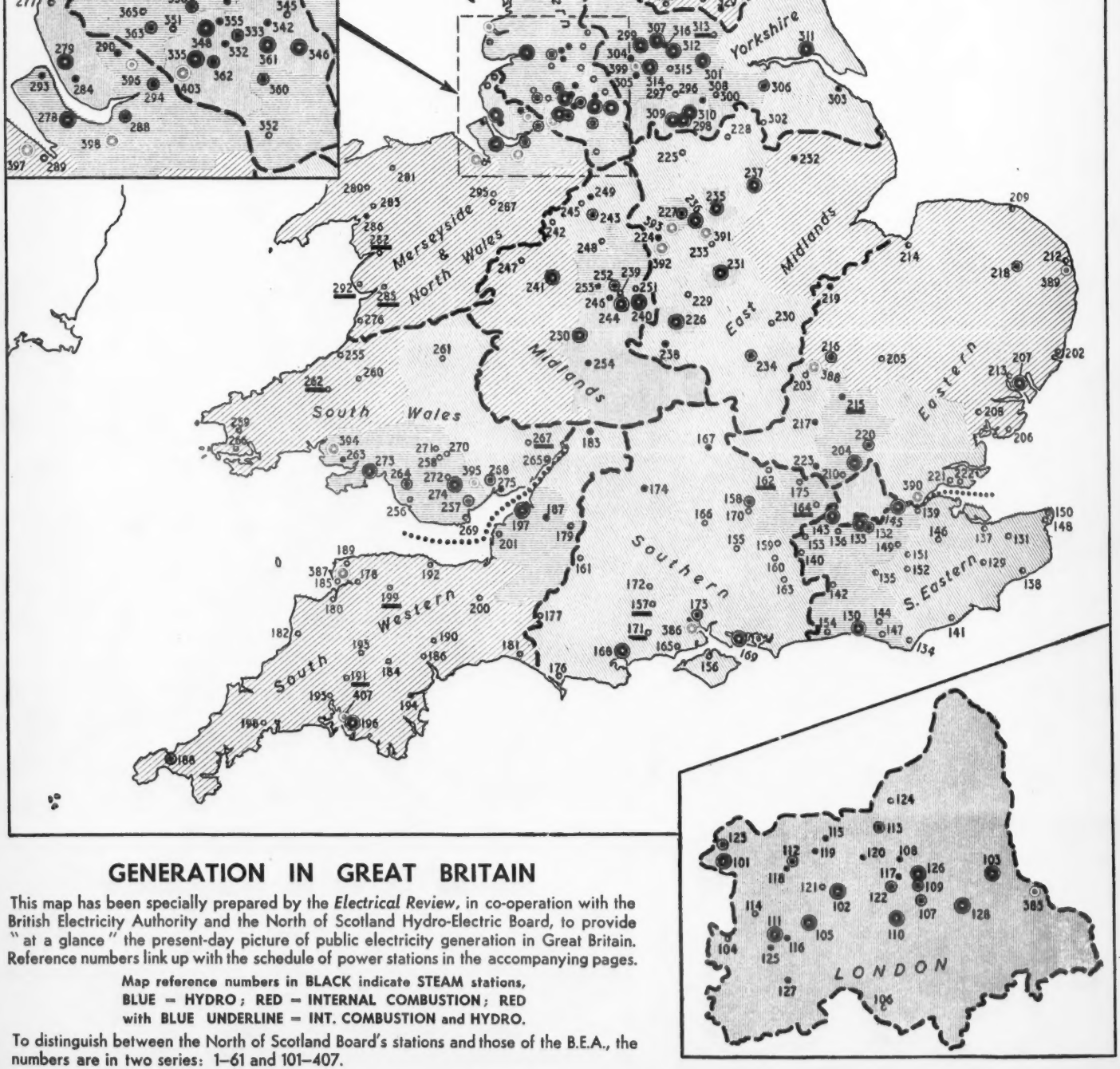
1	2	3	4	5	6	7	8	9	10	11		12	13	14	15	16	17	18	19
[illegible]	[illegible] Thorn	S	T	R.B.	110·0	1×40	1×30	1,350	9×150	600	850	CG	1942	33·0	60	243	22·81	8,222	136
							2×40												
337	Blackpool	S	T	Rd.	12·3	—	—	133	—	245	600	CG	1923	6·6	—	3	7·20	642	6
338	Bolton	S	RTP	R	107·5	—	3×31·25	990	6×165	200	538	CG	1923	6·6	130	293	21·13	6,518	186
										400	800			11·0					
339	Burnley	S	RCT	Rd.	7·3	—	—	108	—	155	518	CG	1905	6·6	30	3	8·02	761	4
340	Bury	S	RT	R	26·0	—	—	305	—	200	580	CG	1921	6·6	40	30	16·92	2,857	26
										300	700								
341	Carlisle	S	R	Rd.R.	86·9	—	2×30	949	5×150	250	650	CG	1923	11·0	40	333	23·04	8,752	209
										600	825								
342	Chadderton	S	T	R	41·2	4×60	—	400	—	250	650	CG	1929	6·6	120	65	16·74	4,557	54
343	Coniston	H	—	—	0·3	—	—	—	—	—	—	—	1932	0·48	—	1	—	8,566	—
344	Darwen	S	R	Rd.	2·3	—	—	24	—	155	500	SS	1912	3·0	—	1	6·27	539	1
345	Greenhill	S	T	R	19·8	—	—	210	—	200	560	CG	1921	6·3	1	25	11·35	2,818	30
346	Hartshead	S	TP	R.Rd.	131·7	—	3×31·25	1,410	7×150	275	675	CG	1931	6·6	40	475	23·66	8,778	265
										620	840								
347	Huncoat	S	T	Rd.	60·0	2×30	2×30	915	3×305	600	850	PF	1952	11·0	120	90	26·23	3,304	41
348	Kearsley	S	RT	R	272·1	—	2×51·6	3,528	16×173	300	675	CG	1929	11·0	180	1,580	25·65	8,784	837
							2×32·25			600	800	SS		33·0					
							2×52												
349	Kendal	I	—	—	0·8	—	—	—	—	—	—	—	1928	6·3	20	0·3	22·57	610	—
350	Lancaster	S	R	R	52·4	—	—	644	2×205	200	538	CG	1916	6·6	50	202	23·13	7,535	123
										400	800								
351	Leigh	S	C	Rd.	4·0	—	—	71	—	175	510	—	1915	6·6	—	1	7·74	720	2
352	Macclesfield	I	—	—	1·2	—	—	—	—	—	—	—	1914	0·48	15	0·2	23·96	395	—
353	Nelson	S	C	Rd.	12·7	—	—	96	—	190	550	CG	1922	6·6	30	7	11·70	1,998	9
354	Padiham	S	R	R	31·4	—	—	322	—	240	620	CG	1926	11·0	40	46	16·32	3,533	39
355	Radcliffe	S	R	R	53·5	—	—	480	—	150	500	CG	1904	11·0	—	50	14·01	3,035	46
356	Rawtenstall	S	RT	Rd.	12·5	—	—	110	—	200	600	CG	1914	6·6	35	13	13·87	2,499	11
357	Ribble	S	R	R.Rd.	181·1	—	4×31·5	2,016	8×187	300	700	CG	1924	6·6	60	604	23·45	8,353	370
										600	850			11·0					
358	Rochdale	S	R	Rd.	6·0	—	—	100	—	180	540	CG	1915	5·8	—	3	6·35	662	6
359	Sedbergh	I	—	—	0·1	—	—	—	—	—	—	—	1935	0·4	—	—	15·93	742	—
360	Stockport	S	RT	Rd.	92·5	—	2×30	870	1×300	210	630	CG	1926	6·6	60	245	24·71	6,969	176
									3×150	400	800	PF							
										600	825	CG							
361	Stuart Street	S	T	R	179·7	—	1×61·5	2,300	2×400	355	700	CG	1936	6·6	—	690	26·47	7,127	414
							3×30·75		2×100	600	850	PF		33·0					
									10×130										
362	Trafford	SC	C	Rd.B.	75·0	—	2×30	740	2×150	400	800	CG	1941	33·0	—	354	25·07	8,642	168
									2×220										
363	Westwood	S	T	Rd.B.	90·0	1×30	3×30	1,050	1×300	600	850	PF	1951	11·0	120	365	22·87	8,523	217
									3×250										
364	Whitehaven	S	S	R	1·2	—	—	32·5	—	150	460	CG	1925	0·43	—	1	8·17	1,566	2
365	Wigan	S	C	Rd.	10·0	—	—	120	—	200	600	CG	1920	6·6	40	12	11·63	2,139	14
							SOUTH EAST SCOTLAND DIVISION												
366	Bonnybridge	S	T	R	70·0	—	—	750	4×120	150	465	CG	1923	6·6	40	243	21·45	7,937	148
										250	650			22·0					
										350	750								
367	Dunfermline	S	R	R	13·0	—	—	160	—	150	500	CG	1919	6·6	20	26	14·42	4,402	31
										250	650								
368	Falkirk	S	T	Rd.	7·5	—	—	87	—	165	573	CG	1921	6·6	19	10	12·60	3,150	13
369	Galashiels	S	R	R	5·6	—	—	70	—	200	650	CG	1924	6·6	50	13	15·05	3,851	13
370	Portobello	S	S	Rd.R	152·5	2×60	1×60	1,260	1×540	290	690	CG	1926	6·6	150	494	29·46	8,658	324
							2×31·25		2×120	1,350	950	PF		13·2					
							1×30												

Map Ref.	Name of Station	Type of Prime Movers	Type of Cooling	Method of Fuel Delivery	Total Gen. Plant in Commission—MW	Extns. Planned or under Constructn.—Generating Sets	Steam Generating Sets 30 MW & above Hydro above 10 MW	Total Boiler Capacity—k lb hr	Boilers above 100 k lb hr	Steam Conditions at Turbines lb /sq in	deg F	Type of Firing	Year oldest set Commissioned	Generating Voltage kV	Cap. Associated Grid Trans. MVA*	kWh Supplied in 1952—Millions	Thermal Efficiency, 1952	Hours Running, 1952	Fuel Consumed Thousand tons Coal only
									SOUTH WEST SCOTLAND DIVISION										
371	Bonnington	H	—	—	9·8	—	—	—	189ft	—	—	—	1927	11·0	—	46	—	8,779	—
372	Braehead	S	R	R	150·0	1×50	3×50	1,800	6×300	900	900	PF	1951	11·0	—	806	27·79	8,667	410
373	Carsfad	H	—	—	12·0	—	—	30	65ft	—	—	—	1936	11·0	15	17	—	2,662	—
374	Clyde's Mill	S	RT	R	217·5	2×30	6×30	2,404	4×180	200	590	CG	1921	11·0	60	1,000	26·66	8,744	593
										385	775								
										600	850								
375	Dalmarnock	S	R	R	162·5	2×60	2×50	1,760	6×200	270	700	CG	1926	6·5	120	492	23·21	8,101	351
										600	825			20·0					
376	Earlstoun	H	—	—	12·0	—	—	44	67ft	—	—	—	1936	11·0	15	21	—	2,726	—
377	Fergushe	S	CP	R	17·7	—	—	270	—	250	620	CG	1923	0·525	15	4	14·35	618	—
378	Glenlee	H	—	—	25·0	—	2×12	1,250	380ft	—	—	—	1935	11·0	30	43	—	2,363	—
379	Greenock	S	RT	R	8·0	—	—	174	—	190	520	CG	1911	3·3	40	1	6·38	380	3
380	Kendoon	H	—	—	21·0	—	2×10·5	40	150ft	—	—	—	1936	11·0	30	43	—	2,971	—
381	Kilmarnock	S	RT	R	85·0	—	2×30	1,070	5×150	250	650	CG	1922	3·3	40	247	19·54	7,280	192
										400	800			22·0					
382	Stonebyres	H	—	—	5·7	—	—	—	97·5ft	—	—	—	1927	11·0	—	24	—	8,783	—
383	Tongland	H	—	—	33·2	—	—	30	106ft	—	—	—	1935	11·0	60	66	—	3,738	—
384	Yoker	S	R	R	100·0	—	2×30	1,200	—	220	675	CG	1929	11·0	66	401	22·55	8,290	260
										385	780								

STATIONS UNDER CONSTRUCTION OR PLANNED

Map Ref.	Name of Station	Type of Prime Mover	Planned Capacity to 1957 MW	Map Ref.	Name of Station	Type of Prime Mover	Planned Capacity to 1957 MW	Map Ref.	Name of Station	Type of Prime Mover	Planned Capacity to 1957 MW
385	Belvedere	S	60	393	Willington	S	200	401	Stella N.	S	240
386	Marchwood	S	300	394	Carmarthen Bay	S	345	402	Stella S.	S	300
387	East Yelland	S	150	395	Machen	S	120	403	Carrington	S	240
388	Goldington	S	150	396	Bold	S	120	404	Fleetwood	S	90
389	South Denes	S	120	397	Connah's Quay	S	180	405	Roosecote	S	120
390	Tilbury	S	360	398	Ince	S	240	406	Barony	S	60
391	Castle Donington	S	300	399	Elland	S	60	407	Plymouth B.	S	60
392	[illegible]	S	340	400	Blyth	S	100				


Shetland
Orkney
North of Scotland H. E. B.
S. E. Scotland
S. W. Scotland
North Eastern
North Western
Yorkshire
GENERATING STATIONS
IN OPERATION
BELOW 20 MW
20—60 MW
60—120 MW
ABOVE 120 MW
UNDER CONSTRUCTION
BELOW 120 MW
ABOVE 120 MW
LOAD DENSITIES
ABOVE 1,000 kW PER SQ. MILE
250—1,000 " " " "
80—250 " " " "
BELOW 80 " " " "
DIVISIONAL BOUNDARIES



GENERATION IN GREAT BRITAIN

This map has been specially prepared by the *Electrical Review*, in co-operation with the British Electricity Authority and the North of Scotland Hydro-Electric Board, to provide "at a glance" the present-day picture of public electricity generation in Great Britain. Reference numbers link up with the schedule of power stations in the accompanying pages.

Map reference numbers in BLACK indicate STEAM stations, BLUE = HYDRO; RED = INTERNAL COMBUSTION; RED with BLUE UNDERLINE = INT. COMBUSTION and HYDRO.

To distinguish between the North of Scotland Board's stations and those of the B.E.A., the numbers are in two series: 1–61 and 101–407.

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VIEWS on the NEWS

By REFLECTOR

IN last week's *Electrical Review* Mr. W. C. Stevens, general secretary of the Electrical Trades Union, in his capacity of editor of the Union's journal, disputed some of the views I expressed upon an article in his journal dealing with the rôle of the British Electricity Authority. I still think that electrical contracting might be left to qualified electrical contractors and I do not understand Mr. Stevens's reference to "restrictions placed upon contracting activities," meaning presumably the Electricity Boards' activities.

* * *

When it comes to manufacturing by the B.E.A., Mr. Stevens says that manufacturing powers were given to the Authority in the 1947 Act "to counter monopoly price control which would become possible in an organized electrical engineering industry with only one main buyer." Strangely enough the fear seems to be on the other side. the manufacturers are afraid that the one ! 3 buyer is in a position to demand terms which they would find extremely onerous. By amicable discussions the fears of both parties have so far been dissipated. Mr. Stevens should know that labour is not the only factor in power station costs; material prices have soared to considerable heights. Moreover, the cost of civil engineering work has been largely responsible for the rise in the cost of power stations per kW installed. I am glad to see that the E.T.U. does not ignore the export aspect of the general question.

* * *

I have also got into trouble with Mr. Richard Royan of West Wickham, Kent, who in a letter in last week's issue accuses me of smugness because I do not believe that solid fuel burning appliances are all that their manufacturers claim them to be. I do not dispute that properly designed and installed appliances fed with the appropriate fuel and intelligently operated represent a considerable advance on the open fire. But how often are these requirements fulfilled? I will plead guilty to scepticism but not to smugness.

* * *

At last week's luncheon of the Batti-Wallahs' Society, Mr. G. F. Peirson, chief engineer of the Midlands Electricity Board, gave a brief talk on "kVA in the U.S.A.," and followed this by showing a film, in colour, taken by him during his visit to the United States as a member of a team studying American electricity supply practice. The film included some admirable "shots" of rural as well as industrial America, and many of the former were of scenes which we are apt to label "typically English." I was particularly impressed by a long sequence showing New York's famous electric signs, for while their dazzling boldness may offend æsthetic tastes, Mr. Peirson's presentation can seldom have been equalled.

* * *

A 75 per cent load factor is reported by the B.E.A. Let me quickly explain that this relates to the "Viscount" turbo-prop aircraft operated by British European Airways. The other B.E.A. has so far achieved only about 51 per cent load factor (based on maximum demand). With a more favourable attitude in industry towards night work, and a better domestic demand, *our* B.E.A. could possibly achieve the higher figure mentioned.

* * *

Discussing the Association's death benefit scheme at a meeting of the National Executive Council of the E.P.E.A., a member is reported by the *Electrical Power Engineer* as saying:—

> "Death benefit should be something worth while even after a comparatively short membership."

I think I can see what he meant.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE deputy chairman of the North Western Electricity Board, **Mr. R. A. S. Thwaites,** B.Sc.(Eng.), M.I.C.E., M.I.Mech.E., M.I.E.E., has announced his intention of retiring on 30th July next. Mr. Thwaites joined the staff of the Yorkshire Electric Power Co. in 1922, after having been on the manufacturing side of the electrical industry for thirteen years with W. H. Allen, Sons & Co., Ltd., Bedford. He remained with the Yorkshire Electric Power Co. as power sales engineer until 1935 when he joined the North Wales Power Co. as development and sales manager and in 1939 he was appointed chief engineer and manager to the company in succession to Mr. G. K. Paton. In 1941 he joined the Manchester Corporation Electricity Department, succeeding the late Mr. J. Harcourt Williams as deputy chief engineer and in 1944 he was appointed chief engineer and manager in succession to Mr. H. C. Lamb, which position he retained until vesting date. Amongst other offices, Mr. Thwaites has successively been chairman of the Yorkshire and North Western Centres of the Institution of Civil Engineers; chairman of the North Western Centre and member of Council of the Institution of Electrical Engineers; and chairman of Council of the British Electrical Development Association. His address from September next will be "Frankfield," Spinfield Lane, Marlow, Bucks. We understand that he will still take an active interest in the electrical industry, but mainly on the manufacturing side.

Mr. R. A. S. Thwaites

Mr. R. J. Gunton has been appointed London manager of Clarkson (Engineers), Ltd.

At a meeting of the Council of the British Association of Machine Tool Merchants (Inc.), held on 18th May, **Mr. H. E. Jones** was appointed secretary of the Association in succession to **Mr. C. W. Allen** who has resigned to take up an appointment as managing director of Trinity Wharf Co., Ltd. Mr. Allen's services will continue to be available to the Association in an advisory and consultative capacity. Mr. Jones was formerly secretary of the British Engineers' Association.

Mr. A. Cody, who for the past four years has been sales manager to Conveyancer Fork Trucks, Ltd., and Electro-Hydraulics, Ltd., leaves this country on 18th June in the *Pretoria Castle* for South Africa on behalf of the Owen Organization. Mr. Cody will spend at least twelve months visiting manufacturers and company agents in South Africa, the Rhodesias, Tanganyika, Kenya, Portuguese East Africa, etc.

Mr. Gilbert F. Sargent, late of Cyc-Arc, Ltd., has been appointed buyer to K.D.G. Instruments, Ltd., and Stow & Partners, Ltd., of Purley Way, Croydon.

Mr. R. K. Fleming, M.I.P.E., F.R.M.S., is relinquishing his position as managing director of the Igranic Electric Co., Ltd., on 30th June and has been appointed chairman of the company in succession to **Mr. G. R. Thursfield** who has retired from the company.

Mr. R. K. Fleming

Mr. Fleming received his training with D. & J. Tullis, Clydebank, and after a period as test engineer in the Engine and Turbine Section of Jas. Howden & Co., Ltd., he was appointed chief engineer at the Lochburn Iron Works, Glasgow, in 1917. From 1920 to 1924 he was superintending engineer (Scotland) with the Harland Engineering Co., Ltd., and in the last-mentioned year commenced his association with the Igranic Electric Co., Ltd., being appointed a director in 1940, and later becoming managing director. He is a founder member of the British Institute of Management.

The Dramatic Society of **Erskine, Heap & Co., Ltd.,** recently produced "Here We Come Gathering," a comedy by Philip King and

Anthony Armstrong. The play was produced by Mr. R. Brett, Mr. W. Hall and Miss Joan Holland.

Lord Reith has been elected a director of Tube Investments, Ltd.

At last week's luncheon of the Batti-Wallahs' Society, **Mr. A. G. Freeborn** was installed as president of the Society, when **Mr. J. W. Perkins**, past-president, invested him with the chain of office. Mr. Freeborn returned the compliment by presenting Mr. Perkins with the past-president's badge.

The Marconi International Marine Communication Co., Ltd., announces that **Mr. G. J. McDonald**, B.Sc.(Hons.), A.M.I.E.E., deputy technical manager of the company, has now been appointed technical manager with effect from 1st April last. Mr. McDonald, who is a native of Bunchrew, near Inverness, was educated at Inverness Royal Academy and went to the University of Glasgow to read for his degree. In 1935 he joined Marconi's Wireless Telegraph Co., Ltd., with whom he was engaged in research and development work under Mr. G. M. Wright, now engineer-in-chief of that company, concentrating especially on direction-finding technique. Later he worked under the late Mr. F. P. Best (whom he now succeeds), when Mr. Best was in charge of the development of marine radio equipment being carried out by Marconi's Wireless Telegraph Co., Ltd., for the Marconi Marine Co., and during the war he was engaged on Naval communications work in liaison with Admiralty officials. Mr. McDonald transferred to the Marconi Marine Co. as deputy technical manager in 1949, rejoining the staff of Mr. Best, who had transferred in 1940 as technical manager.

Mr. G. J. McDonald

Mr. W. Simpson, Associate I.E.E., M.Inst.F., generation engineer (operation) of the South West Scotland Division, British Electricity Authority, has been appointed chief generation engineer (operation) of the Division. Mr. Simpson, who served his engineering apprenticeship with D. Stewart & Co., Glasgow, joined the Clyde Valley Electrical Power Co. in 1914 as junior switchboard attendant at Motherwell power station where he subsequently became charge engineer. For over twenty years he was station superintendent at Clyde's Mill, until in 1947 he became superintendent of the company's power stations. He became generation engineer (operation) with the S.W. Scotland Division in the following year on the reorganization of the electricity supply industry.

At the annual meeting of Allen West & Co., Ltd., last week, the chairman, Mr. M. W. H. Lancaster, said that **Mr. Allen West** had decided not to seek re-election to the board, but to make way for a younger man. Mr. West was the founder of the company in 1910, and in 1914 took over the Reason Manufacturing Co. "When Mr. Allen West was managing director of the company for so many years, he was at the same time the finest sales engineer we have ever had," said Mr. Lancaster.

Mr. A. E. Bennett has been appointed chief engineer in charge of the laboratory of the Dubilier Condenser Co. (1925), Ltd., under the direction of the technical director, Mr. P. R. Coursey, B.Sc., M.I.E.E., and will be responsible for all work connected with design and development. **Mr. H. Andrewes**, O.B.E., M.I.E.E., B.Sc., A.C.G.I., has been appointed technical sales executive, in which capacity he will be in charge of and responsible for the sales of the company's products coming under that heading, including suppression devices.

The Essex Business Houses athletic meeting, of which **Mr. E. K. Cole** is the president for 1953, was held on 23rd May at the Ekco sports ground, Southend-on-Sea. Athletic teams representing firms from all parts of Essex, including Plessey and Marconi, competed for the Association's challenge shield, which was won for the second successive time

Mr. E. K. Cole introducing Mrs. Cole who presented the trophies at the recent sports meeting of the Essex Business Houses Athletic Association held recently at the Ekco sports ground, Southend-on-Sea

by the E. K. Cole team. At the conclusion of the meeting Mrs. Cole presented the trophies.

Mr. R. C. Worster, who has been a member of the research staff of the British Hydromechanics Research Association since its formation, has been appointed deputy director of research.

The Lancashire Area Qualifying Competition in connection with the **Electrical Industries Benevolent Association National Competition** was held on the course of the Withington Golf Club on 5th May. Cards were taken out by 130 competitors. Prizes were presented by Ferguson Pailin, Ltd., Burco, Ltd., Philips Electrical, Ltd., Aerialite, Ltd., W. E. Beardsall & Co., Ltd., L. E. Wilson & Co., Oldham & Son, and the president of Withington Golf Club, Mr. W. Foster, who presented twelve golf balls to the winner of the putting competition. The Ferranti Trophy was won by Mr. J. Bold with a net score of 63, the second best score being 65 by Mr. A. O. Johnson, and the best scratch score, 73, was returned by Mr. W. Foster. The Veteran's Prize was won by Mr. B. L. Heighway with a net score of 69. All these prizewinners are eligible to compete in the national finals at the Sandmoor and Moortown Courses at Leeds on 28th and 29th September next. A visitors' prize was won by Mr. Q. H. Prosser with a net score of 70, and a putting competition by Mr. A. O. Johnson with a score over 18 holes of 30. The day's efforts resulted in a sum of £150 being remitted to the E.I.B.A. funds. The Withington Golf Club Council made a contribution of £5 to the Association.

In our report of the **I.E.E. Golf Competition** held on 12th May at Southport, published in our 22nd May issue, we stated that the profits from the event would go to the E.I.B.A. We are informed, however that the profits will go to the Benevolent Fund of the I.E.E.

Mr. E. E. Rosen has been elected to succeed Lord Brabazon as president of the Radio Industries Club. The vice-presidents are Messrs. A. J. Dew, H. de A. Donisthorpe, A. J. P. Hytch and J. H. Williams. Mr. H. A. Curtis is the new chairman of the Committee, with Mr. R. F. Payne-Gallwey as vice-chairman.

OBITUARY

Mr. W. A. Gillott.—The death is reported of Mr. W. A. Gillott, M.I.E.E., joint managing director of Gillott Electro Steam Cookers, Ltd., on 26th May, at his home in Painswick, Glos. He was sixty-seven. Educated at Latymer School, Hammersmith, Mr. Gillott received his training with the A.E.G. Electric Co., London. From 1905 to 1921 he was with the North Eastern Electric Supply Co., latterly in charge of the cooker department. For two years he was manager of the Jackson Electric Stove Co., Ltd., before serving as advisory engineer to electricity undertakings on domestic electrification. From 1928 to 1932 he was manager of Tricity Cookers (B.E.T.), and then for four years manager of the Heating and Cooking Department of the English Electric Co., Ltd. He was the author of three I.E.E. papers on electric cooking, one (1918) being awarded a premium. He was associated with the original committee which developed into E.D.A., of which he was hon. secretary for the first one and a half years.

Mr. Alfred Weedon Hall, who died on 22nd May at the age of sixty, was one of the band of engineers who assisted Mr. C. S. Franklin in developing the Marconi short-wave beam system for world-wide radio communication in the 1920's. He was trained as an electrical engineer, and after two years' work in the power field, he joined the Marconi Co. in 1913.

Mr. T. W. Merry.—The death occurred at Littlehampton on 26th May, at the age of seventy-six, of Mr. Thomas William Merry, who until his retirement in 1940, was resident power station engineer with the St. Pancras Borough Council Electricity Department. Mr. Merry started his career with the Leyton Borough Council in 1900 and went to St. Pancras in 1903.

Mr. C. E. Cleminson.—The death occurred at Hampstead on 25th May of Mr. Charles Ernest Cleminson, F.I.D., principal and governing director of Vitality Bulbs, Ltd.

Coronation Broadcasting

THE broadcasting of the Coronation on 2nd June was the largest single-day event ever undertaken by the B.B.C. For the sound broadcast over a hundred commentators were in Westminster Abbey and at various points along the processional route. They presented a composite sound picture of the Coronation service and the procession to and from Westminster Abbey in 42 languages apart from English, and many were recorded for historical purposes or for retransmission later.

Television cameras inside Westminster Abbey and at vantage points along the processional route brought to viewers in this country and on the Continent pictures of the service, the procession and other events. Television recordings of the entire programme were also made, some being flown in fast aircraft to appear in the Canadian and American television programmes of the evening of 2nd June.

The task of planning and preparing equipment and services to meet these commitments fell to the B.B.C. Engineering Division. Some 1,300 additional sound circuits and over 100 vision circuits in and around the London area were provided by the Post Office Engineering Department, working in collaboration with the B.B.C. The success of the undertaking depended also on equipment produced by a large number of British manufacturers and contractors.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Domestic Socket-Outlets

MAY I, somewhat belatedly, comment upon the article on domestic socket-outlets by R. J. Courtenay in your issue of 1st May?

At one point Mr. Courtenay says " While it must be remembered that the principal field of application will always be in domestic work . . ." This opinion seems to be somewhat widely held and on several occasions I have encountered opposition to the use of the 13 A socket-outlet in industrial premises. In my view, however, there is no reason whatsoever why the 13 A socket-outlet should not be so used and there are very powerful reasons why it should be used.

Anyone concerned with the use of electric power in a large industrial concern could not fail to be deeply appreciative of one type and size of socket-outlet suitable for every application up to loads of 3 kW. What satisfaction could be derived from the knowledge that every socket throughout the factory, offices and laboratories was of one pattern only and that, consequently, the stroboscope from the laboratory could instantly be used in the machine shop and that the portable drill from the factory could readily be used in the managing director's office! Further, that under these widely varying circumstances every piece of apparatus would be correctly fused according to its current rating and that if a fuse did blow, how convenient to know instantly where the fuse was situated and to find it conveniently placed rather than having to locate a distribution fuse-board and get a pair of steps and then go through the fuses in order to find the blown fuse.

My other comment is that Mr. Courtenay's article leaves one with the impression that the 13 A socket-outlet is inseparably linked to the ring main wiring system. If one employs the ring main system then the 13 A socket-outlet is the best one to use, but it may also be used in circumstances where the ring main is unsuitable. Considering industrial installations in a laboratory for instance, a multiplicity of plugs would be required for bench apparatus, most of which apparatus would be of low current rating and ten sockets could safely and economically be connected to one ring main. In the factory, however, the distance between the sockets and the rating of apparatus which might be connected to them would probably make it uneconomical and undesirable to employ the ring main system. The before-mentioned advantages of the 13 A socket would, however, still obtain.

S. A. STRODE.

Teddington, Middx.

Large Aluminium Cable Sheaths

IN your 8th May issue, page 1075, you published a note stating that a 4¼in outside diameter aluminium tube has been extruded by the Northern Aluminium Co., Ltd., for sheathing a power transmission cable in Canada.

In view of your statement that this tube is claimed to be the largest aluminium cable sheathing tube ever produced, the manufactured lengths being 400ft, may we draw your attention to the fact that for the past two or three years we have extruded such aluminium tubes of a slightly greater outside diameter, namely 4½in, with a wall thickness of 0·19in, which have been used to sheath our 60 ohm high frequency coaxial cable, 32/95, with a diameter over the aluminium sheath of 4½in. We have recently extruded aluminium tubes of 6½in o.d., with a wall thickness of 0·315in, to sheath our 50 ohm 6⅛in h.f. coaxial cable and the latter will be supplied by us and installed within the next few weeks in the Eiffel Tower, Paris, the order covering 1,315ft of this 6⅛in diameter cable.

FELTEN & GUILLEAUME,
CARLSWERK A.G.

Köln-Mülheim, Germany.

Power Shortage in Brazil

Thermal Generation to be Expanded

From Our Rio de Janeiro Correspondent

A SEMI-OFFICIAL statement in the Brazilian Press points out that the shortage of electrical power in the federal capital threatens to become even more serious within the next few months. At the beginning of the dry season (April to October) the Paraiba River, on which basic supplies depend, was 2·7 metres lower than at the same date last year, while the water level in the Ribeirao das Lajes reservoir was the lowest ever recorded. The situation in Sao Paulo is still more critical and has been aggravated by the breakdown of a 65,000 kW generator at Cubatao. In both cities the rationing measures adopted twelve months ago have been tightened up.

Reduced Rate of Plant Installation

The installed capacity in Brazil has not kept pace with industrial development. Consumption is growing at the rate of 10 per cent in Rio and 14 per cent in Sao Paulo, the principal industrial centres, but according to *Conjuntura Economica* the rate of increase in the supply to those two cities has fallen from 8·5 per cent in 1950 to 3 per cent in 1951 and 1·7 per cent in 1952.

In spite of the low calorific power of Brazilian coal and the high cost of imported fuels, thermal generation (which now contributes only 19 per cent to the total supply) is to be expanded jointly with that of hydraulic origin. Thermal power stations will be built as far as possible in coal-mining districts.

To increase the capacity of the Rio-Sao Paulo systems the following projects are to be completed by the dates mentioned: Forcacava station No. 1, 330,000 kW (1954) and No. 2, 390,000 kW (1956); Piratininga thermal station 160,000 kW (1955); and Cubatao 260,000 kW (1955), a total of 1,140,000 kW.

Projects in other regions which have been approved will add 1,602,000 kW to the present capacity of 1,882,500 kW. The Brazilian Traction, Light & Power Co., operating in Rio and Sao Paulo, supplies 66 per cent of the country's power, while 17 per cent is contributed by the Companhia Auxiliar de Empresas Electricas Brasileiras (Bond & Share), operating in the interior of Sao Paulo and in Pelotas, Porto Alegre, Curityba, Niteroi, Victoria, Belo Horizonte, Salvador, Maceio, Recife and Natal. These two groups have obtained the following credits to finance development plans since 1949:—Brazilian Traction: from the World Bank, U.S.$90 million; Bank of Brazil, 200 million cruzeiros (£4 million); and in Canada, $10 million. Empresas Electricas: Export-Import Bank, U.S.$6·4 million; by sale of shares in Brazil, £3.2 million.

The Minas Geraes Government has spent £8 million to date on electrification, but the State's entire programme calls for a £25 million outlay, part of which will be covered by loans from the Washington Banks to finance imports. The Brazil-U.S. Commission is studying a project to raise the capacity of the new Santo Antonio station (see *Electrical Review*, 5th September, 1952) from 100,000 to 140,000 kW.

Hydro-Electric Investigations

The presidential message to Congress at the opening of the new legislative session enumerated ten projects, now before the Special Commission which is studying the possibilities of increased utilization of hydraulic power. One of these, since approved by Congress, allots £400,000 annually during 1953–56 for building a 15,000 kW station at the Dourado Falls, on the Parnaiba River. Two relate to 35,000 and 65,000 kW stations in Santa Catarina, another to a 60,000 kW station in the north-east and a fifth to a 70,000 kW station on the River Corrente in Bahia. The remaining projects are still undergoing preliminary study.

Engineering in Europe

Survey of Current Literature

THE raising of the voltage of the Branweiler-Rheinau power line, of 255 km length, from 220 to 300 kV presented no special difficulties because the original line had been planned with a view to a future increase of the transmitting voltage to 380 kV. The insulation of the line was reinforced by adding from one to three members to each string, whereas masts and conductors did not need changing. The busbars of the substations were also reinforced, the equipment on circuit breakers, isolators and instrument transformers being replaced by 300 kV types. Three-phase booster transformers, 80/300 MVA, were built for the transformation from 220 to 300 kV and are energized on the 110 kV side. The line is now operated with direct neutral earthing which represents a considerable saving on insulation compared with the former operation with compensation by Petersen coils and complies with the new VDE draft regulations VDE 0111/52. The insulation level of the new 300 kV transmission is in good agreement with present v.h.v. practice abroad. The elevation of the transmitting voltage results in an increase of the transmitted power of 140 MW, or 86 per cent, at the minimum expense.—"The 300 kV Branweiler-Rheinau Line," H. Roser, *E.T.Z.(A)*, Vol. 74, No. 4, pp. 93–98, 11th February, 1953, in German.

Line Voltage Tapping

Automatic reclosing practice of power lines fed at either end often necessitates the checking of the voltage on the line and its synchronism. The voltage is usually tapped through a capacitor from the h.f. communication circuit. However, such capacitors are not available on many 110 and 35 kV lines. Experiments with voltage tapping by antennæ were made since 1949 on 110 and 35 kV lines with satisfactory results. The equipment comprised an antenna, the tapping transformer with built-in spark-gap, an external spark-gap and the voltage control relay. Since the potential of the antenna (which is merely an additional conductor, mostly of the length of a single span) is equal to the geometrical sum of the potentials produced in it by the phase conductors, the antenna must be suspended eccentrically with respect to the latter, otherwise its potential would be permanently zero. The most efficient arrangement of the antenna is in the conductor plane, where the conductors are coplanar, and in the plane of two conductors, for a triangular conductor arrangement. The article gives some details about the tapping transformer, mounting of the equipment on line masts and its operation in connection with rapid-reclosing installations.—"Use of a Voltage Tapped by an Antenna from a Transmission Line for Purposes of Automatic Reclosing," N. S. Pekler, *Elekt. St.*, No. 12, pp. 37–39, 1952, in Russian.

Italian 220 kV Grid

The first 220 kV overhead power line on the Continent was taken into service in 1928 in Italy (Isarco line) and ten years later the total length of Italian lines operated at above 100 kV was 11,800 km. This development, though partly interrupted by the war, has continued ever since, stimulated and accelerated by the rapid development and exploitation of the country's water power resources and the necessity of becoming self-sufficient by a forced pace of industrial expansion. The task has been complicated by the fact that the bulk of the supplies comes from the Alpine area and part of it has ultimately to be transmitted through the whole length of the peninsula, although the main centres of consumption are still north of the River Po.

The character of the main problems to be solved is thus obvious and connected with the great variety of climatic, topographic and soil conditions encountered. The greatest versatility was required of the designers and, particularly, the mast types, conductor sizes and suspensions had

to be varied almost continuously in some sections representing extreme cases. The article gives a good idea of these problems and the specific solutions adopted. It is equally true that, with the single exception of the crossing of the Messina Straits, none of the problems mentioned represented an unprecedented case, so that the solutions were mostly available, having been found and used either in the country in similar previous cases or in other countries. Particularly the mast types used represent an "international" assembly with a predominance of Italian and Swiss models. The main interest of the article is thus the way in which these heterogeneous elements are combined to the best effect. Substation design principles and equipment and general principles of protection adopted are also outlined.—"Some Notes on the Italian 220 kV grid," A. Dalla Verde, *Elettrotecnica*, Vol. 40, No. 1, pp. 2–16, 10th–25th January, 1953, in Italian.

Special Capacitors

The advantage of electrolytic capacitors over paper capacitors is their high capacitance per unit volume, but their large losses and leakage currents make them unsuitable for many purposes. In d.c. conditions 500–600 V is the limiting voltage, although a small a.c. component may still be superposed. With pure a.c. the electrolytic capacitor must remain in the circuit only for very short periods. These characteristics indicate that radio-communication and starting circuits for single-phase motors will be the main fields of application for normal electrolytic capacitor types. Development work has now yielded new types of which the specific capacitance is up to twice as high as that of the conventional types, although the losses increase in a still higher ratio. Yet there are uses in which this drawback is not material and the high specific capacitance is all that matters, particularly rapid charges and discharges as used in relay engineering and in certain types of welding circuit.

The author presents a comparative theoretical investigation of the performances of the new type capacitor with large-area electrodes and the conventional type in a charging and discharging circuit. It is found that the equivalent circuit for this analysis must be chosen so as to represent the different behaviour of an electrolytic capacitor during the charging and discharging cycle, viz., two parallel RC arrangements of differing constants. The circuit equations are thus more complicated, yet may readily be solved by operator methods. The numerical evaluation of the results shows in which cases one or the other type of electrolytic capacitor is preferable for technical and economic reasons.—"Special Electrolytic Capacitors in Discharge Circuits," C. A. Trapp, *Tekn. T.*, Vol. 83, No. 9, pp. 165–167, 3rd March, 1953, in Swedish.

High Voltage Fuses

Available h.v. high-duty fuses have a breaking capacity of up to 500 MVA and use either quartz sand or a non-inflammable liquid as the quenching medium. Apart from being expensive, they can be re-generated only by their makers, so that they cannot be readily re-used after a rupture. A new type of expulsion fuse for 16 to 25 kV was therefore developed, suitable for being inserted as an additional element into the fuse handle of a normal tubular fuse for extending the protective range of the latter. The new design of the expulsion tube costs only 10–20 per cent of the price of old types of tubular fuses and it may be regenerated for only 5–10 per cent of this price.

The results obtained under artificially produced short-circuit conditions at the 20 kV low-voltage side of a transformer substation equipped with two 4·5 MVA transformers, 60/20, showed that the fuses could handle short-circuit currents of up to 2,000 A and powers up to 70 MVA. The arcs are quenched generally within the first half-period after the short circuit, as shown by oscillograms taken with a 4-loop oscillograph. The quenching time is not, on the other hand, so short as to produce voltage surges endangering the system. The expulsion fuse described thus represents a reliable and cheap solution of the problem of a medium-power fuse.—"H.V. Fuses and the Development of an Economic Medium-Duty Fuse for Transformer Substations," S. Czajka, *O.Z.E.*, Vol. 6, No. 2, pp. 33–37, February, 1953, in German.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates. —Editors, *Electrical Review*.

Electro-Plastics

The Electrical Aspects of the British Plastics Exhibition

ONE of the prospective exhibitors at the British Plastics Exhibition, which is being held at Olympia, London, from 8th to 18th June, says that all plastic materials are good insulators. In a very limited sense this may be true, but they do not all possess the whole of the variety of electrical characteristics which are called for. For instance, one would not use the same material for making a high voltage insulator and an ordinary domestic lampholder.

It seems that the exhibits which in the main serve the electrical industry are in two broad classes, one having special electrical properties and the other, although serving as a low voltage insulator, being used mainly for its economy in manufacture, or for appearance. We therefore think it advisable for survey purposes to regard the raw materials, including both powders and mouldings (as distinct from assembled products) as electro-plastics and general purpose materials.

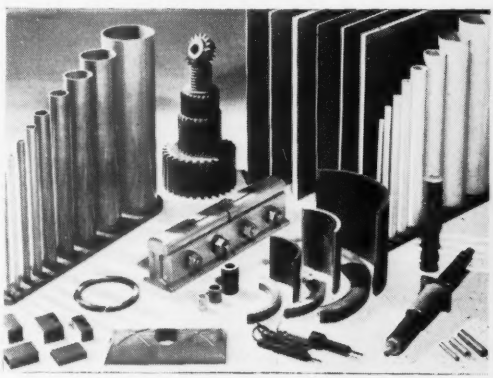
In the electro-plastics field a high place is claimed for "Styrafoil," which is being displayed by BX Plastics, Ltd., a pure polystyrene dielectric material manufactured in film form by a process which imparts to the normally brittle polystyrene a flexibility which enables it to be handled in normal winding processes. It is well suited to applications in electronic equipment where high dielectric strength and low power factor are important, and for the manufacture of capacitors normally having paper dielectrics.

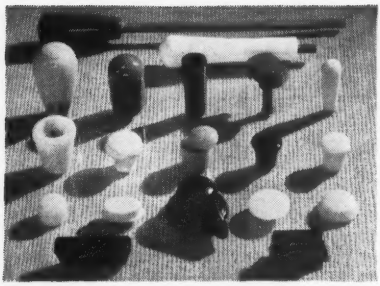
The Plastics Division of Imperial Chemical Industries makes a good showing in this field, particularly in respect of the applications of the following:—"Alkathene" combines a very low power factor with a high volume resistivity and high breakdown strength, and it is a tough flexible insulating material particularly suitable for high frequency applications. "Fluon" has electrical properties similar to those of "Alkathene," but it has a much higher temperature resistance and will withstand the effects of chemicals and corrosive atmospheres. "Welvic" compounds are available in a range of hardnesses and flexibilities, and they can be formulated for a variety of purposes from insulation for house wiring to that for aircraft cables working at temperatures as low as — 50 deg C.

"Epikote" resins, which are to be shown by Shell Chemical, Ltd., are condensation products of epichlorhydrin and di-phenylolpropane. The low molecular weight resins "Epikote 828" and "Epikote 834," are liquids of particular interest as casting resins. They can be cured with amine agents at room or higher temperatures to give tough infusible products with low water absorption and coefficient of expansion. Typical electrical properties for cured "Epikote 828" are: dielectric strength 400–500 V/mil; surface resistivity, $9{\cdot}4 \times 10^{13}$ ohms; power factor at 10^2 to 10^7 c/s, 0·002 to 0·019.

Although Fibreglass, Ltd., does not intend to exhibit fibreglass reinforced plastic products, it will have a stand devoted to technical bureau service work to which visitors can take their problems

Ioco laminated plastics display





Wilmot Breeden control knobs

relating to all fibreglass reinforced plastics products which include electrical items ranging from coil formers to switchgear components.

A very comprehensive display by Ashdowns, Ltd., will include mouldings and extrusions in thermo-plastic materials, paper mouldings and electrical insulation boards. But perhaps of outstanding electrical interest are silicone bonded glass fabric exhibits. Silicone bonded glass laminates will withstand continuous operation temperatures of 250 deg C. Silicone bonded glass laminated board grade G.S./C.5 is supplied in sizes of about 40in by 20in and 20in by 13in, from 0·004in thick. Some of the electrical properties are: power factor at 1,000 c/s and 100 deg C, 0·001 tan d; electrical strength in V/mil at 90 deg C, 450. The ultimate tensile strength is from 11,000 to 15,000 lb/sq in.

One of the pioneers in plastics moulding for the electrical industry, Litholite Insulators & St. Albans Mouldings, Ltd., will display mouldings of the thermo-setting powders, phenolic and urea, with such special properties as high shock resistance and dielectric strength; a comprehensive range of standard products in general use such as terminal blocks, bushes, switch handles and spherical knobs; and examples of insulators in bituminous composition material.

Cellulose acetate films specially formulated for electrical applications will be among the materials displayed by Utilex, Ltd. These films are available in two grades, standard and flexible, and an important feature of this form of insulation is the space-saving quality which permits a reduction in overall size of the component or complete unit without loss of insulation values.

The "Marco" resin display by Scott Bader & Co., Ltd., will largely depict the uses of the material in the electrical industry. These include the impregnation of condenser, transformer and motor windings, as well as the structures for cable junction boxes, h.v. panels and switchgear.

One section of the display of Thermo-Plastics, Ltd., will be devoted to articles from laminates of all types, including glass fabrics, "Durestos," and sandwich construction, and the products will include panels, tubing, bulkheads and curved structures.

In addition to standard grades of phenolic, urea and p.v.c. moulding materials Bakelite, Ltd., will be showing rubber-modified polystyrene for greater impact strength, glass-filled silicone for greater resistance to heat and "Alkyds" with outstanding electrical properties.

"Micor" glass-fibre reinforced fabrics which will be displayed by Microcell, Ltd., have many applications requiring high electrical insulation, such as junction boxes, control panels and busbar chambers. "Micor" glass-cloth laminate, a material of high electrical and thermal insulating values, is available in sheets, tubes and sections, and has a tensile strength of up to 100,000 lb/sq in. "Micor" glass-fibre laminate is a reinforced plastic material available in flat sheets and moulded shapes, and the tensile strength is about 25,000 lb/sq in.

Various types of glass yarns, which are to be displayed by Glass Yarns & Deeside Fabrics, Ltd., are particularly suitable for laminating work, while glass fibres, which will also be shown, can be used for moulding a variety of components such as junction boxes. The non-corrosive property of the material adds to its value in these electrical applications.

Among a wide range of laminated electrical materials which will be displayed by Ioco, Ltd., are round and rectangular paper tubes for busbar and other insulations, and fabric and paper sheets for many types of electrical insulations.

The main display of Tufnol, Ltd., in the electro-plastics field will be centred on sheets, tubes and rods in various grades of Tufnol.

The development of the paper-making process to be portrayed by Wiggins, Teape & Alex Pirie (Sales), Ltd., will show the

range of basic papers they have introduced to the plastics industry. These include paper with high temperature electrical insulation properties. There will be shown also paper-like materials made wholly or partly from glass fibres for use in high temperature electrical insulation work.

Among the electrical materials which will be shown by Erinoid, Ltd., are cellulose acetate in the form of moulding powder, sheets and extruded sections; p.v.c. flexible and rigid sheeting, moulding powder and extruded sections; and polystyrene moulding powder and sheets in various colours.

On the stand of United Ebonite & Lorival, Ltd., there will be mouldings demonstrating the very wide uses of hard rubber, particularly for certain electrical applications for which its characteristics are claimed to be superior to many of the newer synthetic materials.

We think perhaps the " cable industry exhibit " will be the outstanding feature of the display by British Geon, Ltd., because Geon p.v.c. is an excellent dielectric and tough sheathing material. The exhibit will consist of many lengths of different types of p.v.c. insulated and/or sheathed cable and wire, some bared over short lengths to show the construction.

The exhibits of Monsanto Chemicals, Ltd., will deal particularly with the virtues of " Lustrex " polystyrene, but the company will also show coil formers, battery plugs, lighting louvres and p.v.c. insulated cables.

Silicones have firmly established themselves as basic electrical materials largely by virtue of their " by-products," some of which are displayed by the I.C.I. Nobel Division. The fluids " F 110," " F 115 " and " F 120 " possess low temperature viscosity characteristics which make them suitable for use in dashpots. Silicone resins " R 210," " R 230 " and " R 250 " have applications in the coating of glass cloth, for impregnating machine windings and for bonding mica. Cloth coated with resin " R 210 " has a dielectric strength of up to 2,000 V/mil. Elastomer " E 320," which is recommended as a cable covering for use at moderately high temperatures, still remains flexible at between − 55 and − 60 deg C.

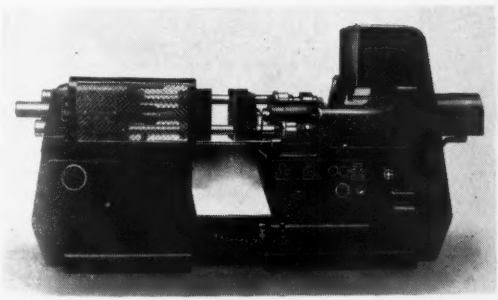
Makers of many classes of moulded electrical components will no doubt find it profitable to view the samples representing the ranges of plasticizers, moulding lubricants and stabilizers for vinyl resins, and emulsifying and drying catalysts on the stand of A. Boake, Roberts & Co. (Manufacturing), Ltd., of which, of particular interest to vinyl resin processors, will be several new additions to the company's range of stabilizers for p.v.c.

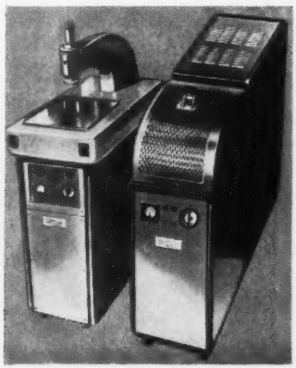
Among the " Telcon " products to be displayed by the Telegraph Construction & Maintenance Co., Ltd., is " Telcothene " in powder form which enables the material to be applied to metal surfaces by a simple hot dip process. This provides a coating which has excellent insulating properties and is proof against corrosion and chemical attack.

The insulating properties of " Phengard," a product of the Phœnix Rubber Co., Ltd., are such that the material is anti-static, and it will be shown in use in a scale model of a medical operating theatre. It is manufactured in rolls 36in

Right: **Thermo-plastic press welders (Radio Heaters)**

Herbert Reed-Prentice 4 oz injection moulding machine





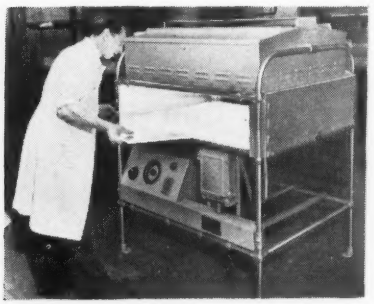
wide with a normal thickness of $\frac{3}{32}$in. It is designed to protect against electrical leakages and the simple earthing arrangements merely involve a 2in metal strip laid on the sub-floor across the room.

Although James Ferguson & Sons, Ltd., are producers of all types of phenolic moulding materials, of urea wood-filled materials and of phenolic and urea resins, they will not exhibit any of their own products, but will display articles (including electrical) produced by some of their customers from these materials.

A good deal of overlapping between the references to electro-plastics and those to general purpose materials is inevitable in any case in such a survey as this, but we think that it would have been diminished if we had been more successful in persuading exhibitors to stress in particular the electrical aspects of the raw materials and products they are displaying. We feel, however, that in the foregoing section dealing with the electroplastics and the following one dealing with the general purpose materials we have been able, on the whole, to give a balanced picture of the major types of materials which will be displayed.

In addition to a wide range of " Elo " plastics, electrical accessories such as lampholders, tumbler switches, plugs and sockets, fuse boxes and so on, in some cases where the emphasis is on the electrical properties and in others where the structural aspect is all-important, Birkbys, Ltd., will be showing moulding powders; resins in solid, powdered and solution forms for all bonding, laminating and impregnating purposes; insulating varnishes; cements, lacquers, filling compounds and sealing fluids; and anti-friction resins for fabric bearings.

G.E.C. infra-red thermo-plastic softening equipment



Barclay-Stuart (Plastics), Ltd., will exhibit various components for the electrical industry produced by the compression and injection processes; a typical example is a junction box for domestic wiring systems.

E. K. Cole, Ltd., will display electrical components ranging from panels for the " Avo " multi-range meter to heavy duty plugs and sockets capable of withstanding severe physical maltreatment, together with such smaller items as switch bases, coil bobbins and parts of sub-miniature components, such as are used for hearing aids. There will also be on this stand complete refrigerators to demonstrate the variety of " Ekco " mouldings used in the manufacture of this kind of equipment, as well as radio cabinets.

The moulded products to be displayed by Kolster-Brandes, Ltd., are mainly of the structural type such as control knobs, valve bases, valve pin protectors, radio cabinets, and Post Office telephone sets.

One of the main ranges of products to be exhibited by Wilmot Breeden, Ltd., will be control knobs for various types of electrical apparatus, and these, we should say, fall largely into the general purpose class. The translucent properties of various plastics can hardly be described as electrical properties, but they have a very direct application to a range of electrical equipment such as lighting diffusion units of all kinds, including a range of car and coach roof lamp diffusers, also by Wilmot Breeden.

In addition to exhibits of their standard " Beetle " moulding powders and resins, the display of British Industrial Plastics, Ltd., will include " Polyester/glass " fibre moulding, the high impact and tensile strength of which, coupled with the flexibility of the process, will open up entirely new fields for this structural plastics material.

Many of a comprehensive range of moulded products which will be shown by British Moulded Plastics, Ltd., are designed especially for electrical purposes and range from one-piece television cabinets made from phenolic material to very small components made from nylon. The moulded products also include battery boxes made from hard rubber and various extruded p.v.c. plastics. The company will also display such raw material as phenol-formaldehyde, urea-formaldehyde, bitumen

asbestos compound, cellulose acetate, polystyrene, polythene and nylon.

Apparatus for the measurement and standardization of colour being displayed by Tintometer, Ltd., is of particular value for laying down standards of colour and for forecasting the results of pigment mixture and investigating colour changes.

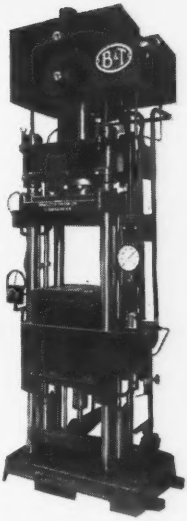
In the structural field are non-plastic components which are used in the assembly of plastic articles such as the large range of "Spire" speed nuts, fixes and clips which will be shown by Simmonds Aerocessories, Ltd. These steel spring fasteners are made for threaded and non-threaded members and are resilient, self-locking and vibration proof. The company will also show various plastic components.

A considerable portion of the exhibition is devoted to equipment specially designed for the production of plastics articles, as distinct from the actual plastics materials, and so a third classification in this survey is processing.

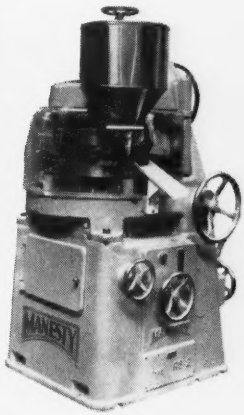
The electrical interest in machinery by which plastics are produced is often very great, for not only are the products of the machines frequently electrical articles in themselves, but the machines are often equipped with good examples of electrical incorporated drives and controls. In this connection a range of plastics moulding equipment is to be shown by Alfred Herbert, Ltd., in association with T. H. & J. Daniels, Ltd. One of these machines is the Herbert Reed-Prentice 5 A 4 oz injection moulding machine which is self-contained and hydraulically operated and can be supplied for either manual, semi-automatic, or fully-automatic operation. It has a die locking pressure of 90 tons.

A hand operated injection moulding machine which will be shown by Asmidar Plastic Moulding Machines, Ltd., is finding favour in the electrical industry, particularly for use in the production of small mouldings from the high insulating value material "Alkathine." It will produce up to 100 injections an hour, depending on the mould design. A rapid vice closure ensures a high mould closing pressure and easy and speedy mould changing. A hopper affords semi-automatic control of the feeds

Of the three injection moulding machine. which will be in actual operation on the stand of Dowding & Doll, Ltd., the new "Lester" injection moulding machine, which has a capacity of 5 oz, is of solid steel box frame construction with a double-toggle locking mechanism. It has an internally heated injection cylinder with a vertical swing-out injection unit. The high locking pressure of 250,000 lb is concentrated within the total moulding area, which allows unobstructed use of the whole of the platen face for die-mounting.



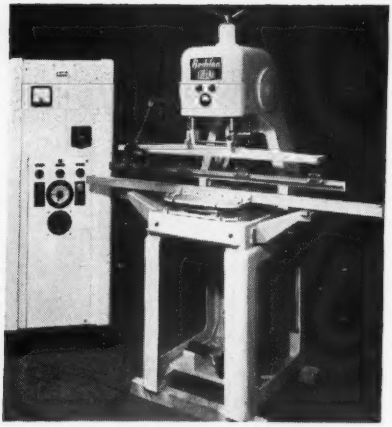
Bradley & Turton 75 ton self-contained moulding press



(*Below*) **Manesty rotary tablet machine**

Among the range of processing machines which will be shown by T. H. & J. Daniels, Ltd., is a 100 ton low pressure press for glass fabric moulding. This is the first of a range of hydraulic presses to be manufactured by this company for reinforced plastics. It has a maximum load of 100 tons, with provision for reducing this to a minimum of 10 tons. The tables measure 4ft by 3ft, the daylight is 7ft and the stroke is 4ft. All the hydraulic equipment is on the press head. The press is push-button controlled and the speed is 5in/sec, although when necessary this speed can be reduced at certain parts of the stroke.

Foster, Yates & Thom, Ltd., will display the "Lancastrian" 50 ton automatic moulding press which is completely automatic from the powder measurement and feeding to the final ejection and checking of the finished moulding and the reinstitution of the moulding cycle. The total time cycle is 15 sec, plus the curing time. The tool area dimensions are 24in by 10in,



Redifon h.f. generator and "J.P.10" welder

with a "daylight" and stroke of 28in and 10in, respectively. The platen and dies are electrically heated.

Many visitors will be interested in the processing machines on the R. H. Windsor, Ltd., stand on account, *inter alia*, of the drives. In two twin screw extruders 5 h.p. and 10 h.p. a.c. commutator motors are used to drive the screws, while a triple screw extruder has an 18 h.p. motor of the same sort. The barrel and die on all three extruders are electrically heated, and three controlling pyrometers regulate the energy input to the heated zones of the machines.

Another good example of the incorporated electric drive is the self-contained 75 ton hydraulic press which will be shown by Bradley Turton, Ltd. It is used largely for the manufacture of such electrical articles as lighting fittings and ceiling roses.

Radio Heaters, Ltd., will be showing two new high frequency thermo-plastic press welders which will take electrodes up to 20 in sq and have outputs of 2 kW and 4 kW respectively. Both machines are available with either pedal or pneumatic operation. It is claimed that the very high operating frequency ensures maximum safety against electrical breakdown through the material.

A new range of high frequency plastic welders will be shown by Redifon, Ltd. The "J.P.10" press welder is provided with a 2·5 kW radio frequency generator and is capable of welding a single straight seam of over 4ft on a contour weld of up to 6ft in complete articles in a few seconds.

On the stand of the General Electric Co., Ltd., there will be shown two types of ovens for the heating of thermosetting materials before moulding. One is a 2 kW plastic preheating generator which depends on high frequency dielectric heating, while the other employs radiant heating by resistance elements. That infra-red heating has inevitably found its way into the plastics industry is evidenced by the G.E.C. display of plant specially developed for the softening of sheets of cellulose acetate and other thermo-plastic materials before shaping by blowing or pressing.

A wide range of plastics processing machines will be displayed by Manesty Machines, Ltd., and the "R.S.2" rotary tablet machine is a good example of the preparation equipment available nowadays. It will produce tablets of up to 1⅝in diameter at a rate of up to 326/minute. The turret is driven by a 5 h.p. motor and the transmission includes a flywheel pulley which is mounted on its anti-friction bearings. A clutch allows the motor to run at full speed under minimum load before engagement of the turret takes place.

The vacuum evaporation process for the deposition of thin films of metals, alloys, oxides, salts, etc., on the bases of various materials for protective, decorative and other purposes, has been widely adopted in the plastics industry for both electrical and non-electrical wares. Among a wide range of coating machines which will be displayed by W. Edwards & Co. (London), Ltd., is model "36E" which has been developed for large scale industrial applications. The capacious work chamber can be loaded with large batches of articles for production coating, and the exhaust system ensures rapid pump-down cycles, thus minimizing production time and cost. Six electrodes provide filament heating circuits and two electrodes serve for the high tension ionic bombardment services.

Electronically controlled vacuum coating plant will be the outstanding feature of the display of R. Y. Pickering & Co., Ltd. This equipment can be used for rapid batch production and it reduces maintenance problems to a minimum. The front panel of the electronic control unit is arranged in the form of a diagram displaying the layout of the vacuum system and indicating system conditions at any instant.

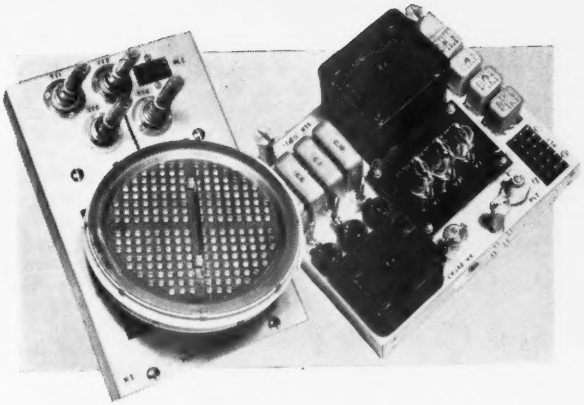


Fig. 1.—" Humicon " temperature and humidity control apparatus with the humidity-sensitive element to the left

Temperature and Humidity Control

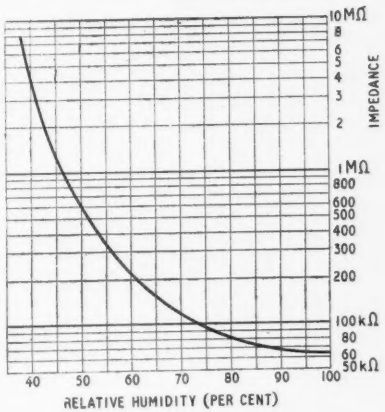
Particulars of the " Humicon " System

A NEW system of temperature and humidity control which has been developed and patented by Standard Telephones and Cables, Ltd., is based on the ability of a humidity-sensitive element, connected in a bridge circuit, to operate thyratrons which, combined with thermometers, control humidity within a given space. This " Humicon " system was designed originally to control humidity by exchanging humidity for temperature. No air-conditioning apart from this was envisaged because of the tropical application of the equipment under control. However, the system is flexible enough to be used in conjunction with air-conditioning apparatus and many other forms of control.

The humidity-sensitive element (Fig. 1) consists of two parallel electrodes the space between which is filled with " Fibreglass " to a given density; the plates are perforated to allow the movement of air through the fibre.

When packed in this way " Fibreglass " has an affinity for moisture because the closely packed glass fibres attract moisture by capillary action. The surface resistance of the glass fibres between the two electrodes changes with moisture content, so that when an a.c. potential is applied between them the current will vary with humidity and not temperature. As the moisture in the atmosphere has a high dielectric constant the capacity between the electrodes will also change with humidity. The impedance, therefore, between the

Fig. 2.—Impedance between detector plates in terms of relative humidity



two plates can be calibrated in terms of relative humidity (Fig. 2).

To keep the circuit impedances to reasonable figures, the standard "Humicon" is arranged to control the working space to a humidity within the region of 60 to 70 per cent so that the element impedance is of the order of 0·5 to 1 MΩ, but other working values can be provided for by changing the value of resistance in the adjoining arm of the bridge network.

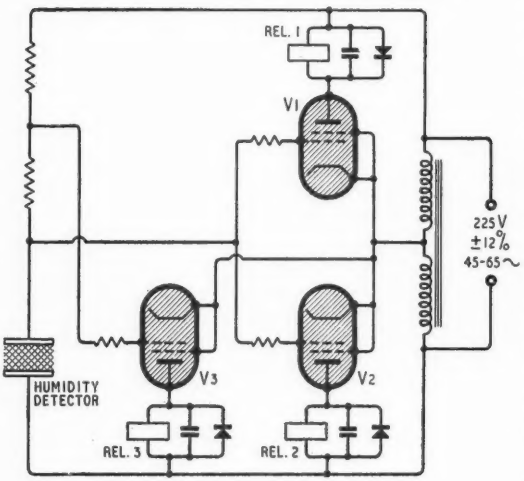
Fig. 3 shows the method of control of the thyratrons and it will be noted that the whole circuit operates from the a.c. mains so that the thyratrons are self-protecting. The settings of a standard "Humicon" are such that if the relative humidity is below 60 per cent thyratron V1 only will be passing current; between 60 and 70 per cent relative humidity, both V1 and V2 will be conducting; between 70 and 80 per cent relative humidity, V2 only will be conducting; and above 85 per cent relative humidity, V2 and V3 will be conducting. The contacts of the relays in the anode circuits of these thyratrons are brought out to connectors so that they can be used to control the air flow, or heater, or air-conditioning plant to govern the space to be controlled.

The sensitivity of the system is at present limited by the thyratrons in the control unit. The operation of the thyratrons (Fig. 4) is limited by the grid characteristics of the tubes and the change in relative humidity to operate V2 and cut off V1 is about 10 per cent. This 10 per cent range of humidity is usually regarded as the limit permitted for the space under control, but the element is capable of detecting a particular humidity within a much narrower tolerance, about 2 per cent. The speed of operation of the element is very high, and a slight movement of air is sufficient to enable the detecting element to control satisfactorily. As the element for the standard application operates with relatively high impedance it is preferable that the distance between the element and the control unit should not exceed 6ft.

To illustrate the system of control for a room where equipment is to be maintained over a full range of tropical conditions, apparatus has been made with the following relay settings for both humidity and temperature. The method of control assumes that no refrigeration or dehumidifying plant is permitted. The settings of humidity and temperature (Fig. 5) are those for a normal control unit, and the conditions in the space under control will be a function of both these settings.

Summarizing the conditions that can exist within the controlled space: for temperatures below 10 deg C the air system would be a totally closed system, and special heaters in this space would tend to raise the temperature to 10 deg C or higher. At 10 deg C the heaters would be switched off, and should the temperature continue to rise, due to dissipation of electrical equipment in its pre-heat condition, the air system will begin to change to an open system at 15 deg C; i.e., external air is entering the system. Therefore, it will be noted that below 10 deg C the control is solely by temperature, between 10 and 15 deg C a combination of humidity and temperature, and above 15 deg C by humidity only; i.e., if, at a temperature slightly in excess of 15 deg C the humidity should be greater than 70 per cent, the air system will again

Fig. 3.—Basic circuit of thyratron control unit



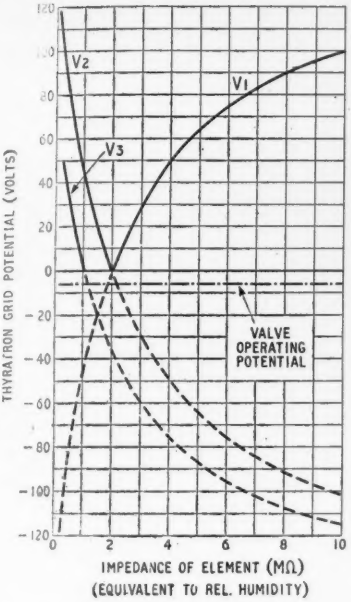


Fig. 4.—Thyratron operating characteristics

close, and as the dissipation of the equipment under control raises the temperature the relative humidity will drop and the air system will again partially open so that the humidity within the space under control will be within the limits of 60 to 70 per cent. In other words, the degree of recirculation of air will be such that the system will "home" to a condition of balance resulting in a humidity between 60 and 70 per cent and a temperature above 15 deg C. If the humidity should be greater than 85 per cent the system will immediately become a re-circulating system and the heaters will be switched on in an attempt to raise the temperature and therefore lower the humidity again to within the controlled region. Where equipment is continuously left unattended thermometers are provided so that warning can be sent to the remote control point when the temperature has reached the dangerous level of 85 deg C, and should no action be taken the system arranges that at 90 deg C the whole equipment is shut down.

For an equipment where sub-ambient conditions are permitted, and therefore

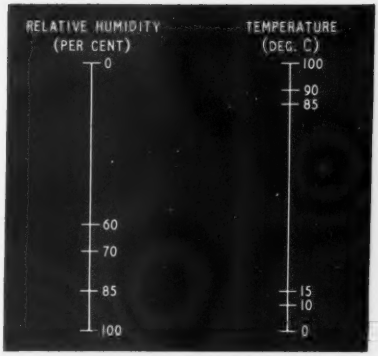


Fig. 5.—Temperature and humidity settings of standard unit

air-conditioning equipment is fitted, the same relays as are used in the foregoing application can now be employed to control the air-conditioning equipment. Another feature of the system is the protection it gives to electrical apparatus operating in atmospheres bearing conducting media such as salt or acid fumes. The calibration of the humidity element will move so that it will tend to maintain constant the surface resistance of insulation in the electrical apparatus. Should the element become contaminated by dust or fumes, it can be re-set to normal by cleaning it thoroughly in distilled water and allowing it to dry out. At the same time all insulating surfaces of the electrical apparatus under control should be cleaned.

NEXT WEEK'S EVENTS

Monday, 8th June to Friday, 12th June

TORQUAY.—British Electrical Power Convention.

Monday, 8th June to Thursday, 18th June

LONDON.—Olympia. British Plastics Exhibition.

Tuesday, 9th June to Thursday, 11th June

HEREFORD.—Three Counties Agricultural Show.

Tuesday, 9th June to Friday, 12th June

SCARBOROUGH.—Association of Mining Electrical and Mechanical Engineers. Convention.

Thursday, 11th June

LONDON.—Lighting Service Bureau, 2, Savoy Hill, W.C.2, 6 p.m. Illuminating Engineering Society. "American Lighting Practice," by Dr. Ward Harrison.

Friday, 12th June

CARDIFF.—Assembly Room, City Hall, 7 for 7.30 p.m. Engineers' Coronation dinner and dance.

ISLE OF WIGHT.—I.E.E. Southern Centre. Summer Meeting.

COMMERCE and INDUSTRY

British Plant for Oregon Scheme

New Chief Joseph Project Tenders

A REUTER message from Washington states that Ferranti, Ltd., has been successful in obtaining the contract for the supply of six 6,500 kW transformers for the McNary Dam, on the Columbia River in Oregon. The British bid of $857,600 (£306,285) was the lowest, the next lowest also coming from a British company, the English Electric Co., Ltd., whose tender was $898,081 (£320,740). The nearest United States competitor, the Maloney Electric Co., St. Louis, tendered for $983,228 (£351,158). Mr. F. Rostron, export manager for Ferranti's, said that work on the contract would begin immediately, and it was expected that the transformers would be delivered on site in approximately two years.

Chief Joseph Dam

The United States Army Bureau of Engineers has announced the tenders for the ten transformers for the Federal Government's Chief Joseph Dam project on the Columbia River. The English Electric Co. submitted the lowest bid for the second time and was $442,751 (about £160,000) lower than the lowest American bid, although the efficiency rating of the British product was slightly below that of the lowest American bidder. The English Electric Co.'s new bid is $70,563 lower than its original one; the lowest by an American firm, Maloney Electric Co. of St. Louis, was $270 higher than originally. According to the Washington correspondent of *The Times*, the bids were: English Electric, $1,761,317 with 99·56 efficiency rating; Industrie Elettriche di Legnano, Italy, $1,830,000 with 99·51 efficiency rating; Maloney Electric Co., $2,204,068 with 99·61 efficiency; Pennsylvania Transformer Co., $2,295,763; American General Electric Co., $2,499,076; Allis Chalmers, Milwaukee, $2,609,775; Westinghouse, $2,679,373. The last four were all listed for 99·51 efficiency.

The Brush Group

Mr. Miles Beevor, managing director of the Brush Electrical Engineering Co., Ltd., announced recently that the Brush Aboe group would in future be known as the Brush Group. It was his intention to use the name of the Brush Electrical Engineering Co., Ltd., which is at present the name of the parent company of the Group, as the name of the manufacturing company representing the electrical side of the Group's business. Brush, Ltd., would be registered as the name of the holding company. The engine manufacturing companies would trade under their own names as at present.

V.H.F. Radio Contracts

The Civil Air Department, New Zealand, will shortly be completing the first stage of a v.h.f. ground-to-air area coverage system, extending from Wellington control centre. It was decided to use v.h.f. multiplex radio links, and equipment designed jointly by Pye, Ltd., and Ericsson Telephones, Ltd., was selected. This has now been completed, and following inspection and test by the British Post Office, on behalf of the New Zealand Government, is awaiting shipment.

The United States Air Force in Europe (Procurement Division) has placed with the General Electric Co., Ltd., a contract worth $1,400,000 for ground-to-air v.h.f. radio transmitters, receivers and spares. They will be supplied to N.A.T.O. countries. The transmitters are of similar design to equipment now being manufactured by the company for the Ministry of Supply.

Factory Building and Management

A guide to the design and construction of industrial buildings entitled "Management and the Building of a New Factory," by C. W. Glover, has been published by the British Institute of Management, 8, Hill Street, London, W.1, price 5s post free (4s to members and subscribers). The book is based on a paper presented at a B.I.M. meeting in the 1952–53 winter proceedings series.

Indian Telecommunications Factory

The Indian Deputy Minister for Defence (Mr. Satish Chandra) is reported by *Indian Trade and Industry* to have said recently that the cost of setting up a proposed electronics and telecommunications factory at Bangalore would be about £5¼ million. A contract had been entered into with the French concern, Cie Générale de Telegraphie sans Fil, in this connection. That firm was to be paid £15,000 for services in connection with the drawing up of the plans and details of building and construction of the factory; £76,875 in connection with the construction and services directly connected with the purchase and installation

of plant and machinery; and £230,000 as payment for technical advice and assistance. Royalties would be paid on actual production: 3 per cent on the first £750,000 worth of goods, 2 per cent on the second £750,000 and 1 per cent thereafter for a period of ten years.

Trade Announcements

The **Electro Dynamic Construction Co., Ltd.**, has appointed L. Rusby & Co., National Employers House, 9, Quebec Street, Leeds, 1, as its representatives for the Yorkshire district.

Clarkson (Engineers), Ltd., have now moved their London office and showroom to 124, Hammersmith Road, W.6 (telephone : Riverside 6645 and 1815). The increased accommodation will give improved facilities and there is an advisory service on milling technique available to all users of milling cutters.

The **Metropolitan-Vickers Electrical Co., Ltd.**, announces that Van Aalst & Co., Ltd., have relinquished their agency in Dublin and until fresh agents are appointed all enquiries should be addressed to 4, Whitworth Street, Manchester, 1.

An office and depot have been opened by the **Donovan Electrical Co., Ltd.**, at 149-151, York Way, London, N.7 (telephone : Gulliver 7898).

Catalogues and Lists

Swift Levick & Sons, Ltd., Clarence Steel Works, Sheffield, 4.—Descriptive leaflet announcing the availability of "Columax" permanent magnets.

Julius Sax & Co., Ltd., 24, Commerce Road, Brentford, Middlesex.—Leaflet illustrating the company's range of bells, indicators, relays, wall sockets and plug tops.

The Tudor Accumulator Co., Ltd., 6-10, Whitfield Street, London, W.1.—Four illustrated leaflets relating to "Safetylyte" emergency lighting equipment

Easco Electrical, Ltd., Brighton Terrace, London, S.W.9.—Priced leaflet describing the Easco "X" range of low voltage lighting equipment.

Permali, Ltd., Bristol Road, Gloucester.—Leaflet for incorporation in the "Permali" data book dealing with applications of "Permali" to the construction and maintenance of unearthed overhead lines (SW.4).

Line Equipment, Ltd., 32, Queen Victoria Street, London, E.C.4.—Illustrated leaflet on "Lel" single and repeater drop-out expulsion fuse switches (FSP.2).

Newman Industries, Ltd., Yate, Bristol.—Two brochures giving details of slip-ring and squirrel cage motors and of the company's range of motors to the draft British Standard CN(ELE)6814.

F. C. Blackwell & Co., Ltd., Great Crosby, Liverpool, 23.—Priced leaflet of "Blaco" conduit fittings and accessories (10).

Colloidal Graphite, Ltd., 6 & 7, St. Dunstan's Lane, London, E.C.3.—Brochures dealing with "Susgra" colloidal graphite products.

F. H. Bourner & Co. (Engineers), Ltd., Manor Royal, Crawley, Sussex.—Illustrated booklet on the "Supa Dynamic" power driving tool including list of accessories and spare parts.

Imperial Chemical Industries, Ltd., Imperial Chemical House, Millbank, London, S.W.1.—Technical booklet on "Kynal" solders and "Kynal" flux for soldering aluminium.

Manchester Metal Works, Ltd., 368-376, Bury New Road, Salford, 7.—Two illustrated leaflets featuring "Manchester" gap gauge blanks and special calipers.

G. & J. Weir, Ltd., Cathcart, Glasgow.—Catalogue illustrating a range of feed water heaters.

Rheostatic Co., Ltd., Slough, Bucks.—Two leaflets dealing with "Satchwell" automatic valves for the control of high pressure hot water distribution (121 and 142).

Wm. McGeoch & Co., Ltd., Warwick Works, 46, Coventry Road, Birmingham, 10.—Two publications, one covering decorative lighting fittings, and the other panel indicator fittings.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 27th June:—

CARBOHM. No. B714,350, Class 9. Electrical resistances, made of carbon or of silicon carbide.—Société Le Carbone-Lorraine, Paris, France. Address for service, c/o D. Young & Co., 29, Southampton Buildings, Chancery Lane, London, W.C.2.

ALLIANCE. No. 714,799, Class 9. Scientific, nautical, surveying and electrical apparatus and instruments all included in Class 9; wireless sets (sold complete); optical, weighing, signalling, checking (supervision), life saving and teaching apparatus and instruments; and talking machines.—Technical Sales (Western), Ltd., Western House, Midland Road, St. Philips, Bristol, 2.

DIAX. No. 715,341, Class 10. Diagnostic X-ray tables.—Philips Electrical, Ltd., Century House, Shaftesbury Avenue, London, W.C.2.

REMAX. No. 708,683, Class 11. Lamps included in Class 11, lamp glasses, anti-dazzle devices for vehicle lamps, lamp reflectors, electric lamp bulbs and holders therefor; and heating, ventilating and air-conditioning apparatus; all for use with motor vehicles.—Remax, Ltd., Remax House, Alfred Place, London, W.C.1.

ZORST. No. 716,680, Class 11. Exhaust fans used in ventilation equipment for exhausting fumes and dust.—Battery Tools & Accessories Co., Ltd., 246-248, Cavendish Road, Balham, London, S.W.12.

Malayan Electrical Imports

Machinery Nearly Doubled

IMPORTS of electrical machinery into Malaya last year were nearly double in value those of 1951 and totalled almost 15 million Malayan dollars. Those of electrical goods and apparatus amounted to $67,346,000, an increase of about 8 per cent on the previous year. The principal items are shown in the accompanying tables with the chief supplying countries and notes of increases or decreases on 1951. The United Kingdom remained the most important supplier except for losing some ground to the United States in the cable trade, but it will be seen that many countries are competing in the electrical trade generally. (Malayan dollar = 2s 4d.)

Table I.—Electrical Goods and Apparatus

Class of Goods	1952 Malayan $(000)	Inc. or dec. on 1951 Malayan $(000)
Automobile lamp bulbs, etc.	188	— 54
From United Kingdom	93	+ 7
,, United States	14	— 69
,, Holland	19	— 15
,, Hungary	53	+ 34
Flash, radio panel and cycle dynamo bulbs	573	— 438
From Holland	58	— 126
,, United States	396	— 149
,, Hongkong	46	— 192
Fluorescent lamps	147	— 370
From United Kingdom	83	— 113
,, United States	29	— 96
,, Holland	32	+ 32
Electric lighting accessories	4,752	+ 1,986
From United Kingdom	3,964	+ 1,928
,, Australia	66	+ 14
,, United States	86	— 32
,, Hongkong	50	— 57
,, Holland	184	+ 14
,, Germany	142	— 63
Wires and cables, not telegraph or telephone, rubber insulated	5,177*	+ 217
Ditto, insulation other than rubber	5,257*	+ 883
Ditto, telegraph and telephone	868	— 336
From United Kingdom	667	— 537
,, United States	201	+ 201
Electro-medical apparatus, X-ray and vacuum tubes	268	+ 107
From United Kingdom	83	— 9
,, United States	46	+ 10
,, Holland	108	+ 86
Ammeters, voltmeters and other commercial electrical instruments	249*	— 44
House service meters complete	416*	— 195
Electrical refrigerators and parts	7,650	+ 1,425
From United Kingdom	2,516	— 222
,, United States	4,942	+ 1,554
Ceiling fans	1,801	— 8
From United Kingdom	1,335	— 205
,, India	350	+ 88
Table fans	1,527	+ 902
From United Kingdom	866	+ 394
,, Japan	513	+ 462
Other electric fans	346	+ 252
From United Kingdom	257	+ 185
,, Australia	20	+ 15
Accumulators	2,778	— 763
From United Kingdom	2,465	— 1,717
,, Germany	69	— 335
,, Australia	220	— 356
Batteries	327	+ 8
Ditto for hand flash lamps	3,234	— 298
From Canada	1,550	— 674
,, United States	1,154	+ 522
,, Hongkong	354	— 218
Transmitters and radio communication apparatus, including radar, excluding valves	2,171	+ 68
From United Kingdom	1,883	+ 134
,, Holland	169	+ 169
Transmitting and industrial valves	322*	+ 75
Other valves	503	679
From United Kingdom	250	744
,, Holland	119	+ 38
,, United States	115	+ 14
Radio and electronic parts and accessories	2,016	+ 531
From United Kingdom	1,605	+ 374
,, Holland	270	+ 95
Electric cooking and heating appliances	1,049	+ 29
From United Kingdom	974	+ 96
,, Germany	38	— 38
Electrical goods and apparatus n.e.s.	4,456	+ 1,191

* Mainly from United Kingdom.

Table II.—Electrical Machinery

Class of Equipment	1952 Malayan $(000)	Inc. or dec. on 1951 Malayan $(000)
Convertors and transformers	2,256	+ 571
From United Kingdom	2,166	+ 528
,, Japan	63	+ 36
Generators	5,976	+ 1,698
From United Kingdom	4,586	+ 708
,, United States	501	+ 358
,, Japan	381	+ 287
,, Australia	97	+ 43
Motors 25 h.p. and under	1,085	+ 260
From United Kingdom	911	+ 182
,, United States	71	+ 26
Motors 25 h.p. to 100 h.p.	435	+ 276
From United Kingdom	348	+ 190
,, United States	30	+ 30
,, Japan	22	+ 22
Motors over 100 h.p.	426	+ 63
From United Kingdom	378	+ 115
,, Italy	32	+ 32
Switchgear	2,675	+ 1,086
From United Kingdom	2,557	+ 982
,, Japan	88	+ 88
Other electrical machinery	2,001	+ 800
From United Kingdom	1,669	+ 565
,, Germany	123	+ 56
,, United States	138	+ 121

ELECTRICITY SUPPLY

New South Eastern Domestic Tariff

Plant Extensions in Trinidad

ONE domestic two-part tariff will take the place of 50 tariffs in South East England on 1st January, 1954. This is the principal effect of the latest measures for standardization of tariffs announced last week by the South Eastern Electricity Board. New quarterly charges, uniformly graded according to area of premises (see table) will replace existing methods which include assessment of charges by rateable value, by number of rooms, size of electrical installation, and by area of premises measured in different ways. Garages, porches and outhouses at present assessable under many existing tariffs will not be included. At present some quarterly charges are payable in advance, some in arrears and some partly in advance or arrears, whereas under the new tariff they will all be related to the last day of the month in which the meter is read. As a result, 323,000 consumers will receive credits amounting to £240,000 and 103,000 consumers will pay an adjustment of charges totalling £40,000. Loss of interest on working capital arising from the later dates to which quarterly charges are payable will cost the Board about £7,000 a year. Against this must be set the savings in administrative costs expected to result from the streamlining of tariffs. The "unit" price, already standardized in existing two-part tariffs, will remain at 1d.

Area of private dwelling, sq ft	Quarterly charge
	£ s d
Up to 700	0 13 0
,, 800	0 14 6
,, 900	0 16 0
,, 1,000	0 17 6
,, 1,100	0 19 0
,, 1,200	1 0 6
,, 1,300	1 2 0
,, 1,400	1 3 6
,, 1,500	1 5 0
,, 1,600	1 6 6
,, 1,700	1 8 0
,, 1,800	1 9 6
,, 1,900	1 11 0
,, 2,000	1 12 6
For each additional 100 sq ft over 2,000 sq ft and up to 5,000 sq ft	0 1 0
For each additional 100 sq ft over 5,000 sq ft	0 0 6

No separate meter charge will be made for credit supplies unless additional meters are installed at the consumer's request. For prepayment supplies a charge of 2s 6d a quarter will be made for a meter for the collection of "unit" charges only and 5s a quarter for the collection of quarterly and "unit" charges.

The new tariff will apply to about 700,000 consumers, of whom 200,000 will pay less or the same as at present, while 500,000 will pay more. Additional revenue from the new tariff is estimated to yield a net £110,000 in the first year and £190,000 per annum thereafter. This is an increase of revenue from domestic two-part tariff consumers of about 1·4 per cent in the first year, in which quarterly charge credits and adjustments will be effective, and 2·4 per cent in later years.

Announcing the new tariff, Mr. Norman Elliott, chairman of the Board, said that although the Board had to meet increased costs beyond its control strenuous efforts had been made to offset these by improved efficiency. In the last two years, during which time nearly 60,000 new consumers had been connected to the Board's mains, the number of employees had been reduced by over 400. On the advice of the Consultative Council the Board had avoided drastic changes in tariffs and had moved towards standardization by stages. The Council had been given full information about the latest changes and had accepted them.

Farmers and Electricity

Alderman W. S. Lewis, chairman of the Midlands Electricity Board, speaking at a meeting of the Consultative Council at Hereford, said that while the Board appreciated the need for rural development, he wished they could get the farmers to use the power fully, not just for television, radio and lighting. From consumption figures it was obvious that they were not using it properly, whereas if they did it would pay them handsomely. If certain restrictions on publicity could be removed he felt the time might come when the Board could send people to advise farmers on the best use of electricity.

Trinidad's Expansion Programme

The Trinidad Government has approved a scheme prepared by the Trinidad and Tobago Electricity Commission which attempts to estimate additional generating plant required up to 1961. The first set required is a 10,000 kW turbo-alternator for the Port-of-Spain power

station, which is now being ordered. Provision is also made for the installation of a further 10,000 kW of plant at the Port-of-Spain power station and 20,000 kW at the Penal power station. Detailed estimates have been completed as far as 1957 showing that an additional $10\frac{1}{2}$ million will be needed to meet this expenditure and the necessary transmission and distribution equipment to deal with the additional load. It is anticipated that by 1957 the maximum demand will be over 30,000 kW and by 1961 about 50,000 kW.

Protest Against Charges

The Wellington (Salop) Chamber of Commerce has decided to support the Oakengates Chamber in protesting against high electricity charges. Mr. A. Fox said that the Electricity Board had "looked in every back alley to get floor space on which to fix tariffs" and he quite expected them to measure gardens next.

Questionnaires are to be sent to members asking for comparisons of bills so that figures can be put to the authorities.

Electrical Installations

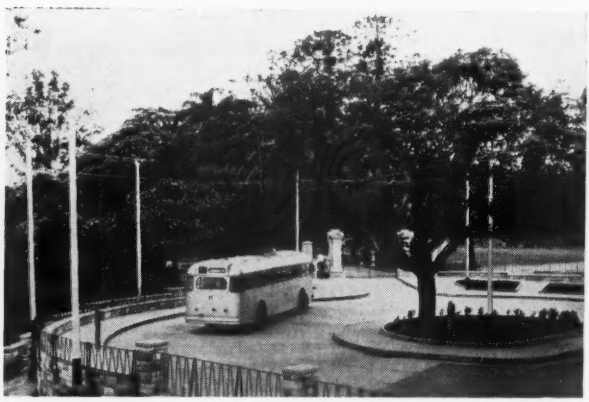
Newcastle-on-Tyne City Council has received loan sanction for £25,317 for the installation of electricity in 980 houses at present served only by gas.

Sittingbourne and Milton U.D.C. has asked for estimates for the provision of electric lighting and power to all their pre-war houses, numbering between 250 and 300.

Winchester Reinforcement

A 33 kV feeder cable is being laid between the grid supply point at St. Cross and Gordon Road, Winchester, to reinforce the supply system.

One of a fleet of thirty Sunbeam-B.T.H. trolley-buses, the first to go into operation in Brisbane, seen at the turning circle by the entrance to the Botanical Gardens. Brisbane continues to use electric power for the bulk of its public transport and has a modern fleet of trams and trolley-buses



STREET LIGHTING NOTES

BOURNEMOUTH Highways and Works Committee is seeking to carry out lighting improvements in Alum Chine, Holdenhurst, Knyveton, Wallisdown and Westcliff Roads, and Talbot Avenue at an estimated cost of £6,725.

CARDIFF Corporation is recommended to carry out a scheme, estimated to cost £10,200, for Class "A" lighting in certain sections of Western Avenue not yet so lighted.

OLDBURY Town Council is making application to the Ministry of Housing and Local Government for consent to borrow £28,300 to meet the cost of improving street lighting along certain bus routes and payments to the Midlands Electricity Board for laying services for schemes already undertaken.

Ministry approval has been obtained to proposals for street lighting on the Kimberworth Park estate, ROTHERHAM, and application is to be made for sanction to borrow £3,189.

SUTTON and CHEAM Corporation reports that the Ministry has approved the Council's scheme, estimated to cost £8,320, for the improvement of street lighting in Central Road, Cheam Common Road, Malden Road, The Broadway, Cheam and Station Way, Cheam.

SUTTON COLDFIELD Town Council is to replace the lighting system along the main trunk road through the borough, provided the Ministry of Transport will contribute half the cost of nearly £7,000. Fluorescent lighting will be installed in the centre of the town and mercury vapour lighting from the centre to the boundaries of the borough.

The chairman of the TAVISTOCK Urban District Council, Mr. W. H. Gulley, J.P., recently switched on the town's new street lighting system. Over ninety "Mazda" sodium lanterns of the latest type now light the main thoroughfares.

WALLASEY Works Committee recommends approval for the conversion from gas to electricity of 193 street lamps in the Moreton area at a cost of £6,350.

WASHINGTON (Durham) Urban District Council is seeking loan sanction for £1,653 for street lighting on the Oxford Avenue housing site, £638 for lighting on the Heugh Hill estate, and £2,086 for public lighting on roads A. 182 and B. 1289.

Manufacture in South Africa

Report on Electrical Industries

ALTHOUGH the information given is not quite up-to-date, little of it being more recent than 1950, a report prepared by the Board of Trade and Industries of the Union of South Africa is a good survey of the scope and trend of electrical manufacturing in the Union.

The report is prefaced by a brief (and therefore incomplete) review of international development and the organization of the electrical manufacturing industry. Thence it proceeds to a study of the South African market for electrotechnical products. A table shows imports and local production from 1928 to 1950 and for comparison purposes the current-price figure is corrected to give " deflated " prices. On this basis net imports in 1950 are estimated at £7·94 million (compared with £12·79 million in 1948) and the net value of local production at £7·18 million (against £2·37 million), i.e., local production in 1950 represented 47·5 per cent of the total for that year, compared with only 15·6 per cent in 1948. It is mentioned that the total installed generating capacity of the Union advanced from 701 MW in 1929–30 to 2,379 MW in 1948–49.

Rapid Expansion

Under the stimulus of wartime conditions electrical manufacturing has made a great advance since 1939 and, the report says, there are no signs of a slowing down in the rate of expansion. In 1950 there were 140 firms in the trade. Of these the four largest were responsible for 39 per cent of the total output; 45 per cent of the firms were concerns (or sections of larger firms producing other things) with an annual output below £25,000.

According to the Board's information 41 companies, including most of the larger producers, were financially associated with overseas enterprises, mostly British. Only one of the " mammoth " American electrical concerns had established a South African subsidiary, and this was of medium size only.

A reasonable measure of specialization obtains in the industry but the Board has found a general desire on the part of manufacturers to produce as many as possible of their components and accessories themselves, although it would often be advantageous to have them made elsewhere. Many firms, in varying degree, are engaged in assembly of parts, and this has been encouraged by import control.

Generators and Motors

After dealing with the planning and control of production, plant layout and factory equipment and the topographical distribution of the industry the report goes on to deal with the industry section by section. First to be given attention is the production of generators and motors. At the date of the report four firms were engaged in the manufacture of motors and one of them was the country's sole producer of alternators and dynamos. One concern makes special flameproof motors only, another additionally manufactures switchgear and transformers, and one switchgear only. Fractional h.p. motor production is considered to be uneconomical and so these machines are not made in the Union. The demand for motors of over 2,000 h.p. is very limited and local plants are not equipped for their production. At 1st March, 1951, 770 people were employed, including 450 Europeans.

In 1950 net imports of motors, parts and accessories were valued at £1,531,000 and local production at £482,000. The figures for alternators and dynamos were £964,000 and £15,000 respectively. Union manufacturers meet 40 per cent of the country's needs of motors between 1 and 250 h.p. but only 25 per cent of the total requirements. Practically all the demand for alternators has to be met from overseas. About two-thirds (in value) of the materials used are procured locally; such items as laminations, bearings, mica insulation and special insulating varnishes are mainly imported. Among the points raised in connection

with this section of industry are the questions of uniform standards, multiplicity of sizes and designs of motors, and export possibilities—which the Board regards rather less optimistically than the manufacturers.

Wires and Cables

Seven firms were producing wires and cables in 1950, three of them being mainly engaged in the manufacture of heavy power types. "Super high-tension" cable, overhead conductors for traction, asbestos-covered wire and telephone cords are not yet made in the Union. About 1,700 people (slightly over 500 being Europeans) are engaged in this industry.

Total net imports in 1950 were £2,129,000 and the net local production was £5,599,000, i.e., 72 per cent of the total consumption. Paper-insulated cables were the largest item: imports £1,316,000; local production £2,525,000 (66 per cent of total). Virtually the whole demand for uninsulated cables and wires is met by local manufacturers; about 70 per cent of the demand for rubber-insulated cables and wires; and about half of the demand for those with other types of insulation. The Board expects the country to become self-supporting in this direction eventually; even h.v. cables, traction conductors and other special types should be producible in times of emergency.

Of the principal raw materials copper, bitumen, cotton and hessian tape, jute yarn, etc., are obtainable locally or from elsewhere in the African continent; lead, raw rubber, p.v.c. compounds, steel tape and paper are imported. Steps are being taken to produce or process some of the latter class of materials within the country.

The possibility of substituting aluminium for copper conductors and sheathing is discussed and in a separate chapter of the report the copper requirements of the Union are studied. The strange position is revealed that the Union's copper production in 1950—36,000 tons—was more than sufficient to meet home needs. Practically all of it was exported, however, and "the copper supply of the Union is as dependent upon imports as if there were no inland copper production at all." The reason for this is said to be that Union copper, as now exported, does not comply with British and I.E.C. standards. The Board accordingly recommends the relaxation (at least temporarily) of specifications, the substitution of other more readily available materials for copper, the use of scrap copper and the establishment of copper refining plant in the Union.

The report says that all the cable manufacturers have adequate factories and a satisfactory standard of technical efficiency prevails. There is some criticism of the method of producing rubber-covered cables. Prices are said to be such as to meet outside competition and in 1950 the value of exports was nearly £800,000.

With the exception of a wire-drawing mill all the firms in this section of the electrical industry are financially associated with overseas concerns. Three are wholly-owned subsidiaries and one is controlled by the British Cable Makers' Association. By these connections the manufacturers receive much technical assistance—a factor which makes an important contribution to their success.

Four firms produce cable boxes (value in 1950, £53,800) mostly for the mining industry; steps were being taken to set up a mechanized foundry which was expected to increase the output of boxes.

Transformers, Switchgear and Control Gear

Dealing with the manufacture of transformers, switchgear and control gear, the report states that the bulk of the output is attributable to a small number of producers. With the exception of transformers, detailed statistics of imports of this equipment are not available. Imports of transformers in 1950 were valued at £1,556,000, against a local production estimated at £562,000. Locally produced transformers are mostly in the class up to 2,000 kVA. Output of other equipment in this section (excluding transformers) during 1950 is assessed at £941,000, and it appears that local production has to be supplemented by imports, particularly for the higher voltages.

To a very large extent local makers of heavy switchgear and control gear produce only the mechanical parts and import electrical instruments and components. Silicon steel, insulating paper and oil, and h.v. insulators are imported but steel sheet, pipes and copper wire are procured locally.

Technical efficiency is considered to be good. Thirteen of the local manufacturers, including practically all the larger ones,

are financially associated with overseas concerns, seven being wholly-owned subsidiaries. South African producers of high voltage gear enjoy a high degree of "natural" protection and they are able to give more favourable delivery terms. Manufacturers have complained of the practice of local users calling for bulk tenders which excludes local manufacturers from tendering for portions of a contract. The Board considers that steps should be taken to remedy this. The mining industry and the Electricity Supply Commission are already departing from this practice; Government Departments and State-controlled institutions should be directed to do so. As regards low voltage gear, circumstances favour overseas producers.

At 1st March, 1951, this section of the electrical industry employed 2,100 persons of whom about 1,200 were Europeans.

Primary batteries are next dealt with. Only one firm (controlled by an overseas concern) was engaged in producing primary cells in 1950; it employed 220 people, mostly Europeans. The value of production in 1950 was £431,000 and imports were valued at £32,000.

Sixteen firms were engaged in accumulator manufacture—mainly for motor vehicles. They had 1,380 workers in March, 1951, of whom 360 were Europeans. Excluding miners' lamp batteries, local industry provided about 88 per cent of the national needs; but it is noted that import restrictions were in force in 1950 and subsequently. Miners' lamp batteries were produced to the extent of half the national needs by a local manufacturer. On the whole, the Board concludes that it cannot be said that a high standard of technical efficiency prevails in the industry.

Domestic Appliances

About 75 per cent of the Union's demands for domestic heating appliances (stoves, hotplates, water heaters, radiators, urns, kettles, percolators, grills, toasters, irons, etc.) were met by the home industry in 1950. Forty-one concerns existed at the end of that year but there have since been several new entrants. Most of them operate on a small scale, the bulk of the equipment being produced by a small number of manufacturers. Employment in 1951 totalled 1,870 (650 Europeans).

Five firms are affiliated to overseas concerns, one being a wholly-owned subsidiary. It is considered that Union manufacturers should be able to maintain themselves against outside competition if they are efficient and produce quality goods.

At the end of 1950 there were three firms producing other domestic appliances but now there are eight manufacturers of refrigerators, one of floor polishers and one of washing machines. Four refrigerator makers are associated with overseas concerns and two others produce under licence from overseas manufacturers. The bulk of the equipment is imported, including the compressor and evaporator units. The demand is put at 42,000 units a year, which coincides with the planned initial capacity of the existing producers.

Electric Lamps

There are two producers of incandescent electric lamps of the general service type (other types are not made in the Union); they employed, in 1951, 572 persons (171 Europeans). The larger concern is jointly owned by five E.L.M.A. firms; the other is financially associated with one of the largest independent British firms. A third of the country's requirements have to be imported but self-sufficiency by 1955 is envisaged. The local industry is essentially one of assembly; practically all components are imported.

Ten firms are engaged in the production of discharge lamps, employing 390 persons (155 Europeans). This, too, is an assembling industry handling imported components.

A small number of firms undertake the production of telephone type relays and intercommunication systems and local subsidiaries of three overseas concerns intend shortly to begin the assembly of telecommunication equipment. A fair amount of production is done by Posts and Telegraph Department workshops and in emergency their scope could be considerably expanded.

Seventeen firms import complete radio receiving equipments and make them up for the local market. Five other firms are now producing a substantial proportion of parts.

More than a third of the Union's requirements of lifts and hoisting equipment is met by four local firms which employed in 1950 about 330 people, half of them Europeans. Two of the firms are controlled by foreign capital. It is thought that the manufacturers are favourably

placed to supply their equipment to neighbouring territories.

Electrical appliances for use in agriculture, electro-therapeutic apparatus and electricity meters and testing equipment are not produced in the Union on a commercial scale.

If mild steel wire is available in adequate quantities the four Union producers of welding electrodes will be able to satisfy the bulk of the requirements. The two firms making electric welding machines meet only a small proportion of the Union's total needs.

Five firms make conduits and three others conduit fittings and the bulk, if not the whole, of the country's requirements could be met by the home industry. It is said, however, that local producers may experience keen competition in the coastal areas.

Local manufacturers supply the whole of the electrical industry's requirements of plastic components with the exception of very large or intricate mouldings. About 40 per cent of the national consumption of porcelain insulators was met by local production in 1950—all for low voltages. The Board says that the factories cannot be considered efficient units and there have been complaints about the products. It is generally conceded, however, that these deficiencies are gradually disappearing. Keen competition is being experienced from certain European countries and Japan.

Working Conditions

Dealing with labour and wages, the report says that of the total factory personnel of the electrical manufacturing industry at 1st March, 1951, unskilled labour constituted 50 per cent, operatives about 35 per cent and artisans (including apprentices) about 12 per cent. The balance was accounted for by factory managers, engineers, chemists, foremen and chargehands. The proportion of European workers was substantially higher than in manufacturing industry as a whole. There is a shortage of skilled workmen.

The basic wage of artisans for a 46-hour week is fixed at a minimum of 3s 6d an hour with graded rates of pay ranging from 3s 3¾d to 8¼d an hour for operatives and rates of 7½d or 9½d an hour for unskilled labourers. There are cost of living allowances and holiday bonuses. While the average hourly income of journeymen is about 12 per cent above their basic wages, operatives receive little, if any, "inducement" wages and the Board counsels the institution of incentive schemes.

A chapter on cost accounting, financing and profitability says that the method of financing is generally sound. The rates of long-term indebtedness to total investment is small and shareholders' interests represent from 67 to 85 per cent of the total operating capital.

The aggregate rate of profit in the cable and wire section of the industry is satisfactory and on the whole the battery section is enjoying marked prosperity. Three of the firms engaged in producing transformers, switchgear and motors operated at a loss during 1950; two others showed profits of 17 and 18 per cent respectively. The profitability of the other sections is not definitely ascertainable.

Import Tariffs

Dealing with import tariffs, the report states that the operative duties on electro-technical products, with the exception of those on accumulators, were levied for fiscal purposes, but some have since assumed a protective character. Generally speaking, however, they are low. Sections of the industry in receipt of tariff assistance by way of rebates of duty are those making stoves and hotplates, batteries, welding electrodes, cables, transformers and motors.

Thus far, says the report, the industry has been operating under exceptionally favourable conditions. Few complaints of severe foreign competition have been received while applications for protective measures have been still more rare. The industry is not at present in need of tariff assistance. Accordingly the Board considers that questions of protection or tariff concession should be left for consideration by way of *ad hoc* inquiries as when applications for assistance are made. Examples of such applications and the action taken are given. One for a rebate of duty on varnished steel tape and bitumen asphalt used in cable making did not receive the Board's support; nor did applications made by manufacturers of l.v. switch- and fuse-gear, automobile batteries, accumulators and household refrigerators (in respect of glass wool). The Board approved an application for a temporary rebate of the duty on imported plastic cases and lids for accumulators.

STOCKS and SHARES

SO far as most people are concerned, investment matters have been thrust well into the background by the brilliant occasions of this season, and the Stock Exchange is occupied with the transaction of little more than essential business. The latter has, however, preserved in markets some mild measure of animation, and its effect has been to put a rather better appearance on the gilt-edged and the industrial price lists. In the electrical equipment market, the main point of interest is the welcome restoration to this country of the American holding of A.E.I. stock. Company news continues to attract attention to individual issues. English Electrics revolve around 56s and General Electrics can be bought at about 41s. Telephone Properties at £5 are a quieter market than of late.

Siemens Results

Siemens Brothers' single dividend payment of 10 per cent for 1952, and the accompanying profits statement, were received in the market with satisfaction, the price of the £1 shares hardening initially to 34s 6d. The latest distribution gives the same total as on the two previous occasions, when, however, 2½ per cent of the 10 per cent was described as bonus. It is payable, moreover, on capital increased by 50 per cent as a result of the "rights" issue of shares at 28s a year ago. Trading profits evidently expanded very usefully, for despite a rise of some £164,000 in the charge for taxation the net profit of £556,000 is within £24,000 of last year's figure. The ordinary dividend involves the distribution of little more than £200,000 net, leaving the best part of £300,000 to be transferred to reserves. The yield on the shares is practically 6 per cent.

A.E.I. New Shares

Ordinary stockholders of Associated Electrical Industries were due to receive this week-end their letters of entitlement to take up the 2·2 million shares held formerly by the General Electric Co. of New York. Following their purchase by London bankers, they are being offered at 75s in the ratio of 33 for every 100 stock units at present held. Within a week of the offer, the market price of the existing shares was a few pence below the 75s level, but when the expenses of dealing were taken into account the "new" still had a distinct advantage. A purchase of the old shares in the market at 74s 6d, for instance, would involve commission and stamp-duty charges (from which the new shares are free) amounting to the equivalent of another 2s 3d per share.

G.E.C. Prospect

With annual results and dividends known for the majority of the companies which end their financial years with the calendar, interest begins to centre now on those making up their accounts for the period ended in March. For the electrical equipment market, the next major event will be, of course, the G.E.C. final dividend and profits statement which appeared last time in July. Since last year the ordinary capital has been increased by the big issue of shares for cash, at a price of 72s 6d, and subsequently by the 100 per cent capital bonus. Market expectations look for a total of 11¼ per cent for the year, equivalent to last year's 22½ per cent allowing for the bonus.

Regarding the further outlook for G.E.C. shares, some favourable conclusions have been drawn in the market from the latest Budget concessions. Abolition of the excess profits levy should mean a good deal to the group after this year, for the last accounts showed a charge of over £200,000 under that heading, although the levy was in operation for only three months of the period. At the same time, the cuts in purchase tax ought, it is thought, to improve matters on those sides of the business concerned with "consumer" goods. At a price of 41s the company's £1 shares show provisionally a yield of 5½ per cent.

Company News

Allen West & Co.'s annual report declared that turnover during 1952, both in value and quantity, was a record in the company's experience. The dividend of 15 per cent, it is shown, took less than £100,000 from a net profit (after all charges) of £429,000. The order book is still described as good, although business is not so easily obtainable. The full report of B.I.C.C. refers similarly to records in turnover last year, and to a decline now in the rate of new orders. The price of the shares hardened to 36s and later returned to 35s 6d. Engineering & Lighting Equipment are increasing their dividend by 5 per cent for the second year in succession, the latest total being 15 per cent. Net profits have increased despite a £30,000 increase in the tax charge.

Our usual share list is omitted from this issue owing to the Coronation holiday.

REPORTS and DIVIDENDS

British Insulated Callender's Cables, Ltd., is holding its annual meeting on 18th June. In his statement, which has been circulated with the report and accounts, Sir Alexander Roger (chairman) says that during 1952 they had a full order book and achieved a record both in volume and value of the turnover. In reviewing the accounts he mentions that £500,000 has been placed to contingencies bringing that reserve up to £2,500,000. This has been necessary in view of the downward trend of raw materials prices, and also because of the flooding of the Erith works in January. The full effect of the loss cannot yet be ascertained but it may possibly be £400,000. Referring to the group activities, practically all members show substantial increases both in the value and volume of turnover.

Dealing with production, Sir Alexander says that easement in the supplies of copper during the year enabled them to achieve an overall volume of output 12½ per cent higher than for 1951. In the power and cables division, output showed an improvement of 30 per cent due in the main to an increase in the l.v. field where their mass-impregnated non-draining cable has been in great demand. Another feature has been the increase in the manufacture of aluminium-sheathed power cable, amounting to nearly three times the production of 1951. Several hundred miles of aluminium-sheathed television relay cable have been manufactured for the North American market. In the telecommunication division, production of telephone cables has been increased to the limit of plant capacity, the loop mileage showing an increase of 32 per cent over that for 1951. The decision to expand the productive capacity for thermoplastic cables began to show effect in the latter months of 1952 by which time the rate of output had increased to double the average for the previous year. The general level of output in the engineering production division has gained momentum during the year. The expansion scheme in their capacitor division was completed in 1952, and output of capacitors showed an improvement of some 90 per cent over the previous year.

With regard to exports it is impossible to assess the value of turnover represented by those of their products incorporated in equipment exported by many plant manufacturing concerns, but direct exports amounted to £20 million. Sir Alexander mentions the recent acquisition of the wire and cable business of Phillips Electrical Works, Ltd., in Canada; the opening of the factory of British Australian Power Cables Pty., a company in which B.I.C.C. are actively concerned, and the formation of British Insulated Callender's Cables (Australia) Pty., Ltd.

At home important contracts include orders received from the British Electricity Authority and the Electricity Boards, and Sir Alexander mentions some of the more interesting orders received.

Lancashire Dynamo Holdings, Ltd.—The report and accounts for 1952 now issued show a trading profit of £477,450, as compared with £471,319 for 1951, after all charges, except taxation. To this is added £10,852 income from investments, and after providing £287,771 for taxation, there is a net surplus of £200,531 (against £221,713). It is proposed to pay a final ordinary dividend of 8½ per cent, making 12½ per cent for the year (same), and to carry forward £574,883 (against £515,913 brought in).

In his statement, Mr. H. W. Bosworth (chairman) says that the Lancashire Dynamo & Crypto Works at Trafford Park and Willesden and Foster Transformers at Wimbledon, achieved record outputs, and the greater part of the group profits were earned by these companies. The Nevelin Electric Co., and Lancashire Dynamo Electronic Products, engaged in the rectifier and electronic industry, made notable progress. The Crypto Co., manufacturing food machinery, suffered from the unfavourable conditions affecting all makers of domestic and similar appliances and the falling off of orders, coupled with licensing difficulties in the export markets, together with the need for heavy writing down of stocks, caused the company to make a loss. The remaining members of the group all contributed to the total profits and particularly good results were obtained by Lancashire Dynamo South Africa. African Electrical Manufacturers, in which they have a 50 per cent interest, has just started production of motors in Johannesburg. There has, however, been serious over production of the smaller electrical goods in the Union which will affect this undertaking.

The Automatic Telephone & Electric Co., Ltd.—In his circulated statement, Sir Alexander Roger (chairman) says that production during the past year was maintained at a high level. Due to the restrictions on the capital investment programme of the Post Office, emphasis has continued on export business. The prospect of the British manufacturer in the telecommunication field, however, is fraught with difficulties, two examples being the growing desire for greater economic independence on the part of non-industrial countries, and the ever-growing demand of the overseas purchaser of capital goods for long term credit. The provision of finance for this purpose on any considerable scale is beyond the resources of even the

large industrial undertakings. After dealing with the progress of subsidiary companies, Sir Alexander says that they have a good order book and the demand for more and improved telecommunication equipment is likely to exist for a long time, but increasing intense competition from foreign manufacturers in the export field will call for greater effort and reduced costs on the part of industry in this country if it is to maintain its position in world markets.

Matthew Hall & Co., Ltd.—In his statement circulated with the report and accounts for 1952, Mr. B. Baden (chairman) says that at an oil refinery they are carrying out lighting, power and earthing installations, and at a plant for bromide extraction, ethylene conversion and di-bromide, they are installing instrumentation which includes approximately 300 pneumatic and electrical instruments and control valves, air and fluid lines and electrical wiring. For several power stations they have received further orders to install plant and pipework, including boilers, cooling towers and generating plant. For the first phase of the new alumina plant in the West Indies they erected nearly twenty miles of pipework and installed more than seventy pumps and over 100 motors up to 150 h.p. and other plant.

The Harland Engineering Co., Ltd., celebrates its fiftieth anniversary this year, and the report and accounts, together with the statement by Mr. H. Cowan-Douglas (chairman), includes a brief history of the company, with illustrations of its works.

The consolidated trading profit for 1952 is £196,239, as compared with £196,383 for 1951, to which is added interest and income from investments of £9,774, making £206,013. After deducting all charges, including £92,457 for taxation, there is a net surplus of £70,511 (against £65,955), of which £10,839 is retained in subsidiary companies' accounts. Reserves receive £30,000, and the dividend for the year is maintained at 10 per cent. The balance carried forward is £44,250 (against £37,528 brought in).

In his statement the chairman says that the works continued at high pressure throughout 1952, and orders have been well maintained. On a money value basis, output increased by 36 per cent and invoiced sales output by 33 per cent. Outstanding orders total over £3,000,000, of which 46 per cent is for export. They completed last year the reorganization of their machine shop and tool room layout. Reorganization of their electrical test facilities was also completed. A start was made late in the year with the erection of the new heavy steel fabrication bay and this new shop is expected to be in use in the latter part of the current year. During 1952 there was a gradual easement in material supplies. Steel plate has, however, not been available in adequate quantities and its shortage continues to be a brake on output expansion. During the year considerable numbers of high pressure boiler feed pumping sets were commissioned in major thermal power stations both at home and overseas, and several submersible pumping installations of large size (250/450 h.p. per unit) were placed into service. Good progress has been made on the large Argentine contract. Although orders have been well maintained there are signs of keener competition in many markets. Hydro-electric business progresses satisfactorily. They have ten turbines on order (four for export) with a total capacity of 83,000 h.p. There are also on their books eight waterwheel generators with a capacity of approximately 25,000 kW, of which one half is for the export market.

Siemens Bros. & Co., Ltd., report a group profit for 1952, after providing £964,224 for United Kingdom taxation, of £556,425, as compared with £579,942 for the preceding year. Reserves receive £296,259, and it is proposed to pay an ordinary dividend for the year of 10 per cent on increased capital. For 1951 the dividend was 7½ per cent, plus a bonus of 2½ per cent on capital existing before the rights issue in July last.

G. N. Haden & Sons, Ltd., announce a group trading profit for the year ended 31st December last of £199,222, as compared with £159,816 for the preceding year. United Kingdom taxation requires £131,470 and overseas taxation £376, less adjustment in respect of previous years £2,008. It is proposed to pay a dividend for the year of 15 per cent (against 12½ per cent).

Allen West & Co., Ltd., report consolidated trading profits for the year ended 31st January last of £1,052,768, as compared with £928,875 for the preceding year, and a net profit, after meeting all charges, including taxation, of £428,818 (against £296,870). The dividend for the year is unchanged at 15 per cent, but is paid on larger capital.

The Engineering & Lighting Equipment Co., Ltd., in a preliminary statement, shows a net profit for the year ended 31st March last of £38,585, after providing £81,000 for taxation. This compares with a profit of £33,616 for 1951-52. The dividend for the year is raised from 10 per cent to 15 per cent.

The Calcutta Electric Supply Corporation, Ltd., reports a gross revenue for 1952 of £4,773,561, as compared with £4,350,517 for the preceding year. Expenditure, including depreciation, amounted to £3,539,645, and other deductions were :—debenture interest £235,149; debenture sinking funds £101,089; retiring fund £35,000; contingencies reserve £65,744, and special appropriations £438,540. The final dividend is 3 per cent, tax free, again making 6 per cent for the year. The balance carried forward is £161,233 (against £170,268 brought in).

The General Cable Manufacturing Co., Ltd., has declared an interim dividend of 12 per cent (same on smaller capital).

The Plessey Co., Ltd., is paying an interim dividend of 12½ per cent (unchanged).

R. A. Lister & Co., Ltd., have declared an interim dividend of 2½ per cent (unchanged).

New Companies

Auto Electricities (Norwich), Ltd.—Registered 18th March. Capital £2,500. Electricians, wiring contractors, electrical, mechanical, motor and general engineers, etc. Directors : N. E. Harvey and D. F. H. Ray. Regd. office : 6, Tombland, Norwich.

Family Television, Ltd.—Registered 26th March. Capital £1,000. Manufacturers of and dealers in automatic and other telephones, wireless, television, telegraphs, wires, cables, lines and appliances of all kinds, etc. C. P. Stonor is the first director. Regd. office : 1/3/5, Franklin Road, Portslade, Sussex.

W. J. Smith (Auto-Electrical), Ltd.—Registered 17th April. Capital £1,000. Electrical storage battery manufacturers, etc. Directors : W. J. Smith and W. F. B. Sutcliffe. Regd. office : 546, Oldham Road, Miles Platting, Manchester, 10.

Frank Stevens (Electrical), Ltd.—Registered 12th May. Capital £3,000. To acquire the business of a radio, television and electrical engineer carried on by F. H. Stevens at Cullompton, Devon. Directors : F. H. Stevens and Mrs. Ruby I. Stevens. Regd. office : 17, Fore Street, Cullompton, Devon.

J. P. Worrell, Ltd.—Registered 18th May. Capital £500. Electrical equipment specialists, etc. Directors : J. P. Worrell and F. Ingram. Regd. office : 58, Robinson Street, Grimsby.

L. L. Samson, Ltd.—Registered 18th April. Capital £1,000. Electrical and mechanical engineers, etc. Directors : L. L. Samson and Elizabeth Samson. Regd. office : 5, Thornhill Road, West Croydon, Surrey.

South B'ham Radio Co., Ltd.—Private company. Registered 10th April. Capital £3,000. To acquire the business of a radio, television and electrical engineer carried on by L. J. Edginton, as South B'ham Radio Co., at 78, Edward Road, Birmingham. Directors : L. J. Edginton and Mrs. Violet W. Edginton. Regd. office : 78, Edward Road, Birmingham.

Electrocrafts (Halifax), Ltd.—Registered 29th April. Capital £1,000. To acquire the business of an electrician and radio engineer carried on by A. Williamson as Electrocrafts at Halifax. A. Williamson is the first director. Regd. office : 185, Gibbett Street, Halifax.

Etherington & Co. (Newhaven), Ltd.—Registered 9th May. Capital £1,150. Electrical engineers, electrical wiring and installation contractors, dealers in electrical apparatus and accessories, radio apparatus, etc. Directors : J. H. Etherington & E. W. Jackson. Regd. office : 5, Meeching Avenue, Newhaven, Sussex.

Cooling Towers, Ltd.—Registered 8th May. Capital £100. To design and construct cooling tower installations for electrical or other power, etc. Subscribers : K. J. Yelland, 20, The Mile End, E.17, and Mrs. Grace A. Martin. Secretary : K. J. Yelland.

Electro-Power Service Co. (Forest Gate), Ltd.—Registered 8th May. Capital £3,000. Electrical engineers and contractors, etc. Directors : J. M. Williams, C. Ruggles and E. T. Bennett. Regd. office : 61, Odessa Road, Forest Gate, E.7.

F. W. Electronics, Ltd.—Registered 9th May. Capital £500. Electrical, radio, radar, television, electronic, mechanical and optical engineers, etc. Directors : J. Wigman and Marion R. Wigman. Regd. office : 16, The Avenue, New Southgate, N.11.

Seddon & Bramhall, Ltd.—Registered 11th May. Capital £500. Electricians, electrical, mechanical, wireless, civil and constructional engineers, etc. Directors : A. Seddon, L. Bramhall, R. Bramhall and H. Bramhall. Regd. office : 30, Bank Street, Sheffield.

Receivers Released

Stokes Appliances, Ltd.—H. Darrell, Bank Buildings, 1, High Street, Croydon, ceased to act as receiver and/or manager on 16th March.

Camden Components, Ltd.—W. G. Russell, Lombard House, Great Charles Street, Birmingham, ceased to act as receiver and manager on 30th March.

Receiver Appointed

Madras Electric Tramways (1904), Ltd.—P. G. Brookes, 1, Rundalls Road, Vepery, Madras, India, was appointed receiver on 27th March, under powers contained in debentures dated 13th October.

Bankruptcies

J. W. Cartwright, 166, Lewisham Road, London, S.E.13, electrical and general engineer.—Receiving order made 19th May on a creditor's petition.

A. E. Dalmon and **S. J. Dalmon,** carrying on business in partnership as sanitary and electrical engineers under the name of P. Dalmon & Sons, at 60, Teville Road, Worthing. —Last day for receiving proofs for dividend 9th June. Trustee, Mr. J. S. Bradley-Hole, 7, Old Steine, Brighton.

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NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 15th July from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1947

23516. Punch Engineering Pty., Ltd.—Multi-channel carrier telephone systems. 26th August, 1947. (694091.)

28857. Flowers, T. H.—Electrical switching system. 27th October, 1948. (694092.)

1948

23808. Western Electric Co., Inc.—Apparatus employing bodies of semi-conducting material. 10th September, 1948. Cognate application 23809, 17th June, 1948. (694021.)

32538. Bayford, L. J. C., Seats, P., and Zouch, L. E.—Manufacture of cathode-ray tubes. 16th December, 1949. (694232.)

1949

5202. Western Electric Co., Inc.—Process for the production of germanium elements for use in the electrical arts. 25th February, 1949. (694022.)

5203. Western Electric Co., Inc.—Electric circuit devices utilizing semi-conductive materials. 25th February, 1949. Cognate application 5204, 26th February, 1948. (694023.)

10341. Western Electric Co., Inc.—Electric signal translating circuits employing semi-conductor bodies. 19th April, 1949. (694024.)

10438. Automatic Telephone & Electric Co., Ltd.—Electrical signalling systems for rail traffic control. 20th April, 1950. (694306.)

10757. Western Electric Co., Inc.—Electric signal translating circuits employing semi-conductor devices. 22nd April, 1949. Addition to 694021. (694025.)

12815. Western Electric Co., Inc.—Electric signal translating apparatus utilizing semi-conductive elements. 13th May, 1949. (694026.)

21556. Electric & Musical Industries, Ltd.—Workholders. 18th August, 1950. (694233.)

26454. Norfolk, C. L., and Godfrey, E. W.—Electric inspection lamps. 12th October, 1950. (694171.)

33222. Western Electric Co., Inc.—Semi-conductive translating devices and methods of making them. 29th December, 1949. Cognate application 33223, 29th December, 1948. (694029.)

1950

2840. Western Electric Co., Inc.—Pulse code translating circuits. 3rd February, 1950. (694030.)

7218. Products & Licensing Corporation.—Television apparatus. 22nd March, 1950. (694175.)

7420. Western Electric Co., Inc.—Electrical devices utilizing semi-conductor materials for the translation of electric currents. 24th March, 1950. (694034.)

7661. Marconi's Wireless Telegraph Co., Ltd.—Echo sounders. 16th November, 1950. (694176.)

10000. International Business Machines Corporation.—Synchronizing clock system. 24th April, 1950. (694110.)

11173. King, F. W.—Overload indicating devices. 7th May, 1951. (694112.)

11082. Western Electric Co., Inc.—Electric signal translating devices utilizing semi-conductive bodies. 6th June, 1950. (694041.)

18521. Minister of Supply—Dielectric-loaded waveguides. 10th July, 1951. (694243.)

18571. Communications Patents, Ltd.—Electric control apparatus. 25th October, 1951. (694180.)

19821. General Electric Co., Ltd., and Hubbold, S.—Holders for electrical devices, especially electric discharge lamps. 30th July, 1951. (694114.)

20226. Western Electric Co., Inc.—Electrical translating devices employing semi-conductive bodies. 15th August, 1950. (694051.)

22611. International Research & Development Corporation.—Sound reproducing devices. 14th September, 1950. (694118.)

23197. Winston Electronics, Ltd., and Stanley Engineering Co., Ltd.—Electric switches having detachable handles. 3rd August, 1951. (694119.)

23903. British Insulated Callender's Cables, Ltd.—Device for handling drums of electric cable and other heavy articles. 28th September, 1951. (694188.)

27399. Parsonage, S. H.—Thermally-operated electrical switchgear. 9th November, 1951. (694196.)

28332. British Insulated Callender's Cables, Ltd.—Manufacture of shaped sections from sheet metal by rolling. 19th November, 1951. Cognate application 7316, 29th March, 1951. (694331.)

28564. Southern United Telephone Cables, Ltd.—Means for the manufacture of electric cables. 21st November, 1951. (694201.)

30566. Milnes, H. R.—Loudspeakers. 14th December, 1950. (694058.)

31260. General Electric Co., Ltd., and Ward, P. W.—Electric pulse reshaping apparatus. 5th December, 1951. (694205.)

31501. Etablissements Aubry et Simonin.—Excitation and automatic regulating device for an electric alternator. 28th December, 1950. (694245.)

1951

30. General Electric Co., Ltd., Dewar, G., and Benbow, C. H.—Devices for measuring mechanical forces. 26th October, 1951. (694335.)

242. Standard Telephones & Cables, Ltd.—Electromagnetic light current contact making relays. 20th December, 1951. (694208.)

1183. Kolster Brandes, Ltd.—Protective devices for vacuum tubes. 11th January, 1952. (694133.)

1740. Pirelli-General Cable Works, Ltd., and Bean, R.—Ropes incorporating electric conductors. 15th January, 1952. (694211.)

2047. Allistone, H. H.—Electric battery lamps. 7th November, 1951. (694247.)

2327. Metropolitan-Vickers-G.R.S., Ltd.—Track braking apparatus. 20th December, 1951. (694212.)

2449. British Thomson-Houston Co., Ltd.—Variable-speed electric motors. 31st January, 1951. (694135.)

9047. General Electric Co., Ltd., and Judson, A. E.—Means for securing apparatus to mounting plates. 26th February, 1952. (694142.)

10625. Midland Electric Manufacturing Co., Ltd.—Electromagnets. 28th April, 1952. (694266.)

17513. Standard Telephones & Cables, Ltd.—Assembly arrangements for wire-ended electrical circuit components. 24th July, 1951. (694148.)

20589. Babcock & Wilcox, Ltd.—Air heaters incorporated in tubulous fluid heaters. 31st August, 1951. (694347.)

23819. Dudenhausen, H. J.—Regulators for electric motors. 12th October, 1951. (694077.)

25346. British Thomson-Houston Co., Ltd.—Multi-position electric rotary switches. 30th October, 1951. (694151.)

28502. Neoliza Zahnfabrik Akt.-Ges.—Electric oven for the burning of ceramic articles. 5th December, 1951. (694153.)

29703. Bayford, L. J. C., Seats, P., and Zouch, L. E.—Apparatus for the manufacture of cathode-ray tubes. 16th December, 1949. Divided out of 694232. (694286.)

1952

49. British Thomson-Houston Co., Ltd.—Control systems for jet-propulsion systems. 1st January, 1952. (694156.)

3778. Allmanna Svenska Elektriska Aktiebolaget.—Three-phase commutator motors with speed regulation by brush displacement. 13th February, 1952. (694157.)

6668. Philips Electrical Industries, Ltd.—Methods of sealing rectangular glass windows to rectangular cones. 14th March, 1952. (694290.)

7377. Standard Telephones & Cables, Ltd.—Electron discharge apparatus. 21st March, 1952. (694159.)

9394. Philips Electrical Industries, Ltd.—Frequency detectors. 15th April, 1952. (694291.)

10331. British Thomson-Houston Co., Ltd.—Steam irons. 24th April, 1952. (694296.)

GERMAN ELECTRICAL IMPORTS

IMPORTS of electro-technical products, including machinery, into Western Germany last year increased by about one-third in value on 1951. The total was about DM. 77 million. The accompanying table shows the chief items and supplying countries. No detailed comparison with 1951 is possible because of the radical changes in classification which were introduced at the end of September of that year. The only goods which were imported to about the same extent as they were exported were electric hearing aids, shavers and hair cutters. The only noteworthy contribution made by Great Britain was in batteries, some household appliances, ignition and lighting equipment, welding apparatus, hearing aids and radio apparatus.

Class	1952 DM. (000)
Generators, motors, transformers, convertors, etc., up to 10 kW	1,548
From Saar	663
„ *Holland*	325
„ *Switzerland*	344
Ditto, 10 to 1,000 kW	3,978
From Saar	2,109
„ *Switzerland*	873
Ditto, over 1,000 kW	346
Generator sets	285
Transformers and choking coils	1,690
From Switzerland	972
Current regulators	483
Electro-magnetic apparatus	610
From Austria	348
Permanent magnets	55
Primary coils and primary batteries	255
From Great Britain	203
Accumulators	154
From France	110
Elec. operated tools and machine tools	431
From Switzerland	212
Vacuum cleaners and floor polishers, household	862
From Great Britain	210
Washing machines, household	571
From Great Britain	384
Fans, up to 600 W	36
Other household appliances up to 15 kg	480
From Great Britain	388
Shavers and hair cutters	2,968
From Holland	1,996
Ignition equipment for i.c. engines, semi-diesel or diesel engines	470
From Great Britain	156
Elec. equipment n.e.i. for cycles, motor vehicles, aircraft, ships, etc.	3,223
From France	260
„ *Great Britain*	298
„ *Italy*	1,854
Elec. welding apparatus	2,787
From Great Britain	351
„ *Sweden*	561
„ *Switzerland*	981
Elec. ovens, industrial and household	886
From Switzerland	744
Pressing irons	10
Other heating appliances and parts	1,294
From Holland	535
„ *Switzerland*	248

Class	1952 DM. (000)
Arc lamps	119
Portable elec. lamps with batteries and the like	12
Radiological apparatus and accessories	1,824
From Holland	1,118
Electro-medical, surgical, dental apparatus	795
From Sweden	422
Telephonic apparatus	578
From Holland	244
Telegraphic apparatus	343
From United States	211
Microphones, amplifiers, loudspeakers, etc.	1,143
From Holland	1,060
Elec. hearing aids	775
From Great Britain	165
„ *United States*	224
Radio apparatus	5,079
From Great Britain	913
„ *Holland*	1,927
„ *United States*	1,165
Supersonic or electro-magnetic echo-sounding apparatus and detectors	177
From United States	45
Signalling and safety apparatus	274
From Switzerland	120
Elec. goods and apparatus, n.e.s.	1,080
From Great Britain	302
Elec. condensers	1,259
From Holland	839
„ *Switzerland*	234
Current or voltage controlling, regulating or distributing apparatus	2,269
From Switzerland	1,793
Cable	148
From Belgium	79
Insulated wire, flex, etc.	680
From Japan	83
Carbons, etc.	896
Insulators	245
From Switzerland	131
Parts of insulating materials	77
Conduit, tubing, etc.	79
Elec. lamp bulbs and tubes	6,0[illegible]
From Holland	3,1[illegible]
Thermionic or electronic tubes and valves (not for lighting)	9,9[illegible]
From Holland	6,6[illegible]
„ *United States*	1,1[illegible]
Other parts of elec. machinery and apparatus	144

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Altrincham. — 23rd June. Corporation. Street lighting equipment. (See this issue.)

Ashbourne.—30th June. U.D.C. Street lighting equipment. (See this issue.)

Dagenham. — 30th June. Street lighting equipment. (See this issue.)

Greece.—ATHENS.—11th June. Ministry of Public Works. Reconstruction Procurement Committee. Supply of geo-electrical and electrical instruments. (C.R.E. 18368/53. Ten/6472.)*

Tangier.—30th July. Tangier Water and Electricity Board. Fluorescent street lighting equipment. (C.R.E. 17921/53. Ten/6471.)*

ORDERS PLACED

Amble (Northumberland).—U.D.C. Electrical installations in 26 houses on the Links estate, Amble.—N. Young.

Carlisle.—City Council. Electrical installations in 134 houses.—North Western Electricity Board.

Cheadle.—Cheshire County Council. Electrical installation at Grammar School for Girls, Cheadle Road.—Cohen Bros. (Electrical), Ltd.

Middleton. — Corporation. Recommended. Supply and installation of electrical fittings in 160 houses on the Brookside estate (£3,751).—Marlow Electrical Co.

Newcastle-on-Tyne. — Education Committee. Electrical installation at Rutherford College of Technology, stage 2 (£19,428).—Robson & Coleman, Ltd. Installation at Jesmond Dene House School (£2,921).—Dougal & Railton.

Seaton Valley (Northumberland). — U.D.C. Supply of 344 electric cookers.—English Electric Co., Ltd.

Sutton Coldfield.—Highways Committee. Installation of street lighting in Chester Road (£3,036).—General Electric Co., Ltd.

Tottenham.—Highways and Works Committee. Recommended. Public lighting improvement schemes (£13,283).—British Thomson-Houston Co., Ltd.

Walsall. — Housing Committee. Electrical repairs to Council houses for a period of twelve months.—Truman Electrical Co.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Horse Guards Avenue, Whitehall, S.W.1 (Trafalgar 8855).

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Extensions for Moore Medicinal Products, Ltd.; T. S. Sutherland & Partners, 1, Queen's Terrace, Aberdeen.

Accrington.—Flats (21 blocks) at Huncoat; borough surveyor.

Ampthill and Newport Pagnell. — Extension and reconstruction of Birchmoor Waterworks; Lemon & Blizard, Castle Lane, Southampton.

Audlem. — Fire station; E. M. Parkes, Cheshire county architect, The Castle, Chester.

Ayrshire.—New workshops, offices and boilerhouse at Lugar for N.C.B. (£195,000); J. Laidlaw & Sons, Ltd., Dalmarnock Road, Rutherglen.

Barry.—Shopping centre, White Farm housing estate; borough surveyor.

Bath.—Physiotherapy department at Bath and Wessex Hospital; South Western Regional Hospital Board, Tyndall Park, Bristol.

Beaulieu.—Fire station for Hampshire C.C.; county architect, The Castle, Winchester.

Birmingham.—Houses (117), Wychall Farm estate, and flats and houses on sites at Stirchley, Sheldon, King's Norton and Rednal House estate; H. J. Manzoni, city engineer.

Bootle.—Infants' section of Netherton Moss County Primary School; borough engineer.

Bournemouth.—Flats (38), Manor Road; A. J. Seal & Partners, architects, Majestic Chambers, Westover Road.

Brentwood. — Flats (48), Ingrave site; housing architect, Town Hall, East Ham.

Brownhills (Staffs).—Factory; Perfichrome, Ltd., St. John Street, Lichfield.

Buckinghamshire.—Fire station, Waddesdon; county architect, County Hall, Aylesbury.

Cardiff.—Further 600 houses, Llanrumney estate; city surveyor.

Cheltenham.—Shops with flats over on the Rowanfield estate; G. Gould Marsland, borough surveyor, Municipal Offices.

Chesterton (Staffs).—Factory extensions; Thomas & Evans, Ltd., Corona Works, Sandford Street.

Colwyn Bay.—Houses (48), Voryn Avenue, Old Colwyn, for T.C.; Ashworth Bros., Penrhyn Avenue, Rhos-on-Sea.

Consett.—Houses (73), Woodlands Road estate, Shotley Bridge, for U.D.C.; J. J. Eltringham, architect, Derwent Street, Blackhill.

Cookham. — Houses (46), Cookham Rise; R.D.C. surveyor, Bath Road, Maidenhead.

Coventry.—Science block at Cauldon Castle Secondary School; city architect.

Dartford.—Houses (54), Hawley and Farningham; borough surveyor, Barclay's Bank Chambers, High Street.

Doncaster.—Block of 12 shops with flats and communal laundry, Beckett Road; borough architect.

Dumfries.—New factory for Northern Wholesale Dairies, Ltd., at Park Place; T. Martin & Son, 41, Bank Street, Dumfries.

Durham.—Modern school at Newton Aycliffe (£137,000) and infants' school at Peterlee (£60,000); county architect, Court Lane, Durham.

Edinburgh.—Additions at Leith for British Ropes, Ltd. (£18,000); own architects.

Felling (Co. Durham).—Houses (100), Leam Lane, Heworth; R. Morton, chief housing officer.

Glasgow. — Alterations and additions to factory of Collins, Ltd., Alexandra Parade; Magnus Duncan, 243, Eglinton Street, Glasgow, C.5.

Alterations and additions at Pollokshaws Road for Gardner & Greenshields, Ltd.; A. D. Holmes, 79, West Regent Street, Glasgow, C.2.

Alterations and additions for Fuller's, Ltd., at 93/99, Buchanan Street and 7/9, Gordon Street; Cullen, Lochhead & Brown, 119, Cadzow Street, Hamilton.

Extension at Cogan Street, Pollokshaws, for Donaldson & Filer, Ltd.; J. T. Thomson, MacCrae & Saunders, 212, Bath Street, Glasgow.

Adaptations and extensions at South Street, Scotstoun, for Alex. Stephen & Sons, Ltd.; own architects.

Gobowen.—Bungalows (28) for the Dame Agnes Hunt Memorial Committee; J. R. Rhaiadr-Jones, Derwen Cripples' Training College, Oswestry.

Greenock.—Alterations and extensions for Fleming, Reid & Co., Marina Mills (£12,500); own architects.

Guisborough.—Proposed new "Park Lane Hotel" for the Hope and Anchor Brewery Co., Ltd. (first stage); H. L. Nunweek, architect, Mazda Buildings, Campo Lane, Sheffield.

Halifax.—Houses (66), Roper Green, Mixenden, and four flats at Moor Lane; borough surveyor, Crossley Street.

Harold Hill.—Factory; M. Cooper (Overalls), Ltd., 103, Queens Road, E.13.

Hayes (Middlesex).—Dwellings (63), Barnhill estate; U.D.C. surveyor.

Hensingham.—Fire station and 10 firemen's houses for Cumberland C.C.; J. H. Hanghan, county architect, Kendal.

Hornchurch.—Flats (36), Rainham Road, Elm Park; P. L. Cox, clerk to U.D.C., Council Offices, Billet Lane.

Hounslow.—Office block, Great West Road; H. S. Goodhart-Rendel & Partners, architects, 13, Crawford Street, W.1.

Ilford.—Flats (20) for old persons; borough surveyor, Town Hall.

Kendal.—Houses (54), Hall Garth estate, for T.C.; W. H. Ainsworth & Co., 14, Minis Feet Road.

Leamington Spa.—Houses (139), Lillington; C. H. Osborne, quantity surveyor, The Parade.

Leicester.—Shops and maisonnettes, Eyres Monsell estate; city architect.

London.—HENDON.—Flats (26), Kenilworth Road; borough engineer.

STEPNEY.—Depot buildings (£40,000), Greenfield Road; borough engineer.

ST. MARYLEBONE. — Primary school, Cosway Street; J. & R. Rooff, Ltd., builders, Crown Works, Boundary Road, E.13.

Luton.—Flats (48), Farley Hill and Runfold estates; borough engineer.

Ambulance station, Leicester Road; Bedfordshire county architect, Shire Hall, Bedford.

Houses (100), on site at Houghton Regis; J. A. Murch, surveyor, 73, West Parade, Dunstable.

Macclesfield.—Houses (29) at Weston estate; borough architect.

Northants.—Adaptation of former casual ward at Glapthorn Road Hospital, Oundle, as a home for aged (£10,000); county architect.

North Riding.—Proposed Eastfield County Junior School and Marske County Infants' School; education secretary, County Hall, Northallerton.

Northwood.—Extensions to Mount Vernon Hospital; Y. J. Lovell & Son, Ltd., builders, Marsham Lane, Gerrards Cross.

Redditch.—Houses (56), Batchley estate, for U.D.C.; C. Bryant & Son, Ltd., 65, Whitemore Road, Small Heath, Birmingham.

St. Helens.—St. Peter and St. Paul Catholic Primary School, Haresfinch; W. & J. B. Ellis, architects, Barclays Bank Chambers.

Scarborough. — Extensions at St. Luke's Church, Scalby Road; F. J. Johnson, architect, 16, High Street, Bridlington.

Sheffield.—First stage of colleges of technology and commerce in Pond Street; R. T. James & Partners, architects to T.C., 6, Lower Grosvenor Place, London, S.W.1.

Southport.—Crematorium at Scarisbrick; borough architect.

Southsea.—Departmental store; Handleys, Ltd., Palmerston Road.

Spalding.—Houses and flats (44), St. Paul's estate; U.D.C. surveyor, Short Street.

Swale (Kent).—Houses (20), on several sites; R.D.C. surveyor, Bell Road, Sittingbourne.

Uxbridge.—Dwellings (55), Corwell Lane; U.D.C. surveyor.

Walsall.—Branch library at Coalpool for B.C.; W. Kendrick & Sons, Ltd., Tasker Street.

Wood Green.—Houses (23), Farrant Avenue; Artizans & General Properties Co., Ltd., 1, Cromwell Road, S.W.7.

Yoker.—Erection of new works at Bulldale Street, Yoker, for Drysdale & Co., Ltd.; John Keppie & Henderson & J. L. Gleave, 196, West Regent Street, Glasgow, C.2.